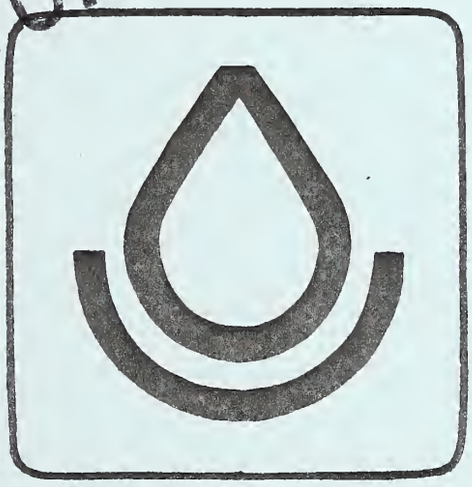
SOIL SURVEY

TROY-BULL LAKE AREA
LINCOLN COUNTY, MONTANA



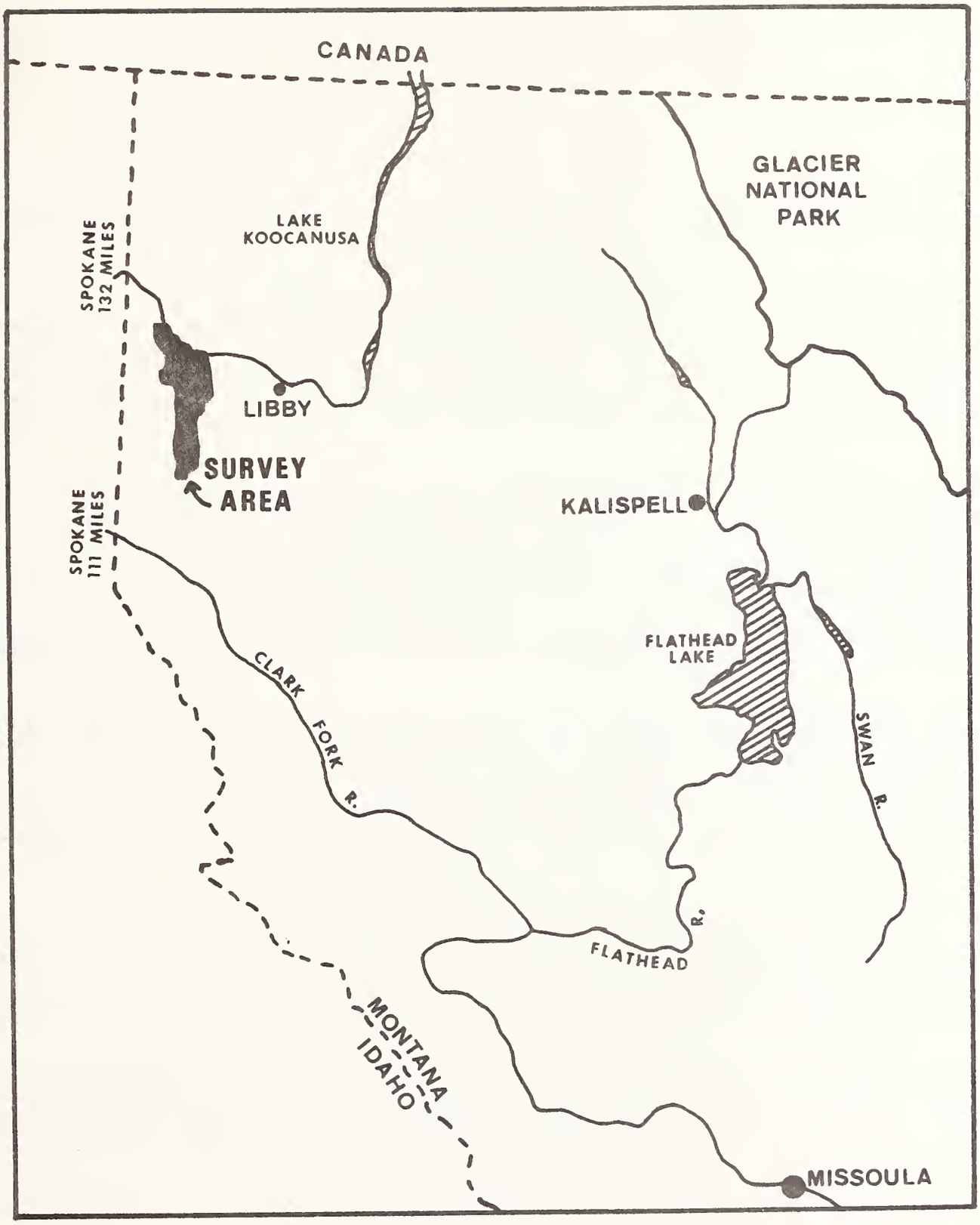
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

1980

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies; state agencies, including the Agricultural Experiment Stations; and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period July to November 1979. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980. This survey was made by the Soil Conservation Service. It is part of the technical assistance furnished to the Lincoln Conservation District.

Soil maps in this survey may be copies without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.



GENERAL LOCATION MAP

TROY-BULL LAKE
SPECIAL SOIL SURVEY AREA

LINCOLN COUNTY, MONTANA

SCALE: 1" = APPROX. 22 MI.

FOREWORD

The main objective of this soil survey was to provide soil resource data and interpretations for urban-related developments. A second objective was to provide information on soils relative to woodland potential.

This soil survey contains information that can be used in land-planning programs in the Troy-Bull Lake area of Lincoln County, Montana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Foresters can use it to evaluate the potential of the soil and the management needed for maximum fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists and specialists in waste disposal and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information is available at the Kalispell office of the Soil Conservation Service.

Acknowledgement for assistance in this soil survey is extended to the Montana Agricultural Extension Service, St. Regis Paper Company, United States Forest Service, and the Lincoln Conservation District.

Van K Haderlie
State Conservationist
Soil Conservation Service

SOIL SURVEY OF TROY-BULL LAKE AREA LINCOLN COUNTY, MONTANA

Report by Arial Anderson and Harold E. Hunter
Field work by David J. Marrett and Steven G. VanFossen
Soil Conservation Service

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

1980

TABLE OF CONTENTS

TABLE OF CONTENTS

HOW TO USE THIS SOIL SURVEY

All the soils of the survey area are shown on the detailed map at the back of this publication. This map consists of five sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by numerical symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside, and a pointer shows where the symbol belongs.

To find information about the soil or soils within a given soil boundary, the first step is to find the name of the map unit from the Numerical Listing of the Map Units at the back of this publication. Once the map unit name is known, information about the soil or soils can be found in the soil descriptions and soil series and morphology sections and in the tables. The information contained in these sections and in the tables is alphabetically arranged.

GENERAL NATURE OF THE SURVEY AREA

The Troy-Bull Lake soil survey area is located in the Kootenai River and Lake Creek Valleys of Lincoln County in northwestern Montana. These valleys are surrounded by the rugged Cabinet and Purcell Mountains, most of which are in the Kootenai National Forest. Approximately 36,000 acres are in the survey area.

The land within the survey is mostly owned by private individuals, the St. Regis Paper Company, and the State of Montana. The area's economy has traditionally been based on timber production, the railroad, recreation, and small mines. Today's economy is changing rapidly due to the development of a major mine at Mt. Vernon, mineral explorations throughout the Cabinet Mountains, a possible hydroelectric project at Kootenai Falls, and increasing rural homesite development.

The landforms in the area are terraces, glacial till plains, some moraines, foot hills, and mountains. These landforms are largely the result of glaciation.

The climate is cool and moist, moderated by Pacific air masses, lakes, and rivers. This type of climate is well suited to timber production. Paper birch, cottonwood, and coniferous species grow and reproduce well in the area. The conifers are ponderosa pine, Douglas-fir, western larch, western white pine, grand fir, spruce, lodgepole pine, western hemlock, and western red cedar.

Many sites support complex stands of three to seven tree species and 10 to 25 understory plants. Douglas-fir is the climax tree on approximately 25 percent of the driest sites, including a few hot microsites with bunchgrass understories. The majority of the area has grand fir, western hemlock, or western red cedar as the indicated climax overstory. Wet sites have spruce or cedar. Subalpine fir and other cold site indicators are extremely rare within the survey boundaries but are very common in the surrounding mountains. A more detailed discussion of forest vegetation appears in the woodland section of this report.

Climatic data indicate the town of Troy (elevation 1,900 feet) has a mean annual temperature of approximately 46 degrees F and mean annual precipitation of 25 inches. It is believed that Troy and the gravelly terraces within 4 miles to the north, east, and southeast have the warmest and driest climate in the survey area. Limited data indicate about 40 inches of precipitation near Bull Lake (elevation 2,324 feet). This makes the Bull Lake area the most moist part of the survey area.

Climate and vegetation are very important in the formation of soils. Soil series have a typical range in climate and vegetation. In mountainous terrain the plants and soil are more influenced by the effective climate (or micro climate) of one particular slope or portion of a slope than they are by the dominant climate of the area. Thus, a steep, southwest-facing slope is effectively much drier than a gentle north-facing slope half a mile away, although both receive the same amount of precipitation. Factors which influence effective climate include: aspect (direction of slope), slope gradient (steepness), exposure to wind, surrounding vegetation or bodies of water influencing humidity, cold air drainages, shading by other mountains, and certain physical soil features.

The topography of the Troy-Bull Lake area has influenced the presence of complex mixtures of plant communities. Some of these have been expressed in the design and delineation of soil map units; other mixtures of plant communities cannot be expressed in soil mapping because of their temporary nature, scale, or independence of any observable soil differences.

The Troy-Bull Lake area and surrounding areas have very high scenic and recreational values. Fishing, hunting, hiking, boating, photography, swimming, camping, cross-country skiing, snowmobiling, snowshoeing, trapping, and observing wildlife and wild scenery are probably the most popular forms of recreation. Most lakes, rivers, and streams are high-quality fisheries containing rainbow, brown, cutthroat, and brook trout, whitefish, kokanee, salmon, and even sturgeon below Kootenai Falls. Other wildlife in this part of the Kootenai includes eagles, osprey, grizzly bear, black bear, moose, elk, mule deer, whitetail deer, bighorn sheep, mountain goat, lynx, mountain lion, bobcat, coyote, wolverine, beaver, marten, marmots, fishers, and many other species. Timber wolves and woodland caribou have been occasionally reported in the general area.

HOW THIS SURVEY WAS MADE

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "Soil maps for detailed planning."

SOIL MAPS FOR DETAILED PLANNING

The map units on the detailed soil maps in an envelope at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil. They can be used to plan management for fiber production; to plan land use; and to enhance, protect, and preserve the environment. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

Soils that have about the same profile make up a soil series or variant of a soil series. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture, slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Courville gravelly silt loam, 4 to 10 percent slopes, is one of several phases in the Courville series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A soil complex consists of two or more major soils. Areas of these soils are so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Mitten-Sharrott Variant complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ from those of the major soil or soils. Such differences could significantly affect use and management of the map unit. The included soils are identified in each map unit description. In some survey areas, a few included soils are identified on the soil maps by a spot symbol.

Many surveys include miscellaneous areas. Such areas have little or no soil material and support little or no vegetation. Riverwash is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a spot symbol.

SOIL DESCRIPTIONS

1A--Udifluvents, occasionally flooded

This unit consists of nearly level, mainly well drained to somewhat poorly drained, deep, loamy, sandy, and gravelly soils. They are on stream terraces and flood plains along major streams in the survey area. These units are dissected by stream channels and are subject to occasional flooding. Included are small areas of poorly drained soils.

Surface runoff is medium, and the water erosion hazard is severe. A seasonal high water table, where present, occurs during April through June.

Small areas of this unit are used for hayland and pasture. Some areas are used for timber production.

2A--Somers Variant silt loam, 0 to 2 percent slopes

This deep, poorly drained soil is on terraces in the southern part of the survey area. It formed in alluvium. Elevation is 2,400 to 2,700 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days. Included in this unit are small areas of Antero Variant, Mission Variant, Savenac Variant, and Stryker Variant soils. Also included are small areas of Marsh land.

Typically, the surface of the Somers Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is very dark gray silt loam 3 inches thick. The subsurface layer is gray silt loam 5 inches thick. The subsoil is dark grayish brown silt loam 10 inches thick. The substratum to a depth of 60 inches is olive gray silt loam and very fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 10 to 30 inches from April through June.

This soil is used for woodland.

Forest management

The Somers Variant soil is suited to Engelmann spruce and western redcedar. Yield estimates were not made.

3A--Stryker Variant silt loam, 0 to 2 percent slopes

This deep, poorly drained soil is on terraces in the southern part of the survey area. It formed in alluvium. Elevation is 2,300 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Mission Variant and Somers Variant soils. Also included are small areas of Marsh land.

Typically, the surface of the Stryker Variant soil is covered with a mat of partially decomposed forest litter 3 inches thick. The surface layer is black silt loam 3 inches thick. The subsurface layer is dark grayish brown silty clay loam 5 inches thick. The subsoil is olive gray silty clay loam 20 inches thick. The substratum to a depth of 60 inches is mainly gray silty clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 8 to 20 inches from April through June.

This soil is used for pasture.

4B--Yellowbay sandy loam, 0 to 4 percent slopes

This deep, well drained soil is on terraces in the northern part of the survey area. It formed in alluvium. Elevation is 2,000 to 2,400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of Selon Variant soils.

Typically, the surface layer is brown sandy loam 9 inches thick. The subsoil is brown and yellowish brown sandy loam 12 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly loamy sand.

Permeability is moderately rapid to a depth of 21 inches and very rapid below this depth. Available water capacity is low. Effective rooting depth is about 24 inches. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this soil are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Yellowbay soil is suited to ponderosa pine and Douglas-fir. The site index is 90 for ponderosa pine and 55 for Douglas-fir. The potential annual production (CMAI) per acre is about 80 cubic feet or 300 board feet (Scribner rule) for ponderosa pine or 80 cubic feet or 270 board feet for Douglas-fir. Potential production is estimated for an even-aged, fully stocked stand of trees.

5B--Antero Variant sandy loam, 0 to 2 percent slopes

This deep, poorly drained soil is on terraces in the west-central part of the survey area. It formed in alluvium. Elevation is 2,400 to 2,500 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Mission Variant, Selon Variant, and Somers Variant soils.

Typically, the surface layer of this Antero Variant soil is dark gray sandy loam 5 inches thick. The subsoil is gray and olive gray sandy loam 17 inches thick. The upper 18 inches of the substratum is olive gray sandy loam. The lower part to a depth of 60 inches is gray loamy fine sand stratified with very fine sandy loam and silty clay loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 5 to 24 inches from April through June.

Most areas of this soil are used for pasture and hayland. A few areas are used for woodland.

Forest management

The Antero Variant soil is suited to Engelmann spruce, lodgepole pine, and Douglas-fir. Yield estimates were not made.

6B--Selon Variant-Yellowbay complex, 0 to 4 percent slopes

This map unit is on terraces in the north-central part of the survey area. Elevation is 1,900 to 2,400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 80 days.

This unit is aobut 60 percent Selon Variant very fine sandy loam and 25 percent Yellowbay gravelly sandy loam.

Included in this unit are small areas of Antero Variant, McCaffery Variant, and Yellowbay sandy loam. Also included are small areas of soil on short, steep slopes between terrace levels. Included areas make up about 15 percent of the total acreage.

The Selon Variant soil is deep and well drained. It formed in alluvium.

Typically, the surface of the Selon Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown very fine sandy loam 11 inches thick. The subsurface layer is brown fine sandy loam 15 inches thick. The subsoil is dark brown sandy loam 26 inches thick. The substratum to a depth of 60 inches is dark grayish brown loamy sand.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The Yellowbay soil is deep and well drained. It formed in alluvium.

Typically, the surface of the Yellowbay soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is brown gravelly sandy loam 8 inches thick. The subsoil is brown and dark brown very gravelly light sandy loam 18 inches thick. The substratum to a depth of 60 inches is dark yellowish brown and mainly extremely cobbly sand.

Permeability is rapid to a depth of 32 inches and very rapid below this depth. Effective rooting depth is about 32 inches. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Selon Variant soil is suited to ponderosa pine, Douglas-fir, and western larch. The site index is 105 for ponderosa pine, 60 for Douglas-fir, and 70 for western larch. The potential annual production (CMAI) per acre is about 105 cubic feet or 430 board feet (Scribner rule) for ponderosa pine, 90 cubic feet or 320 board feet for Douglas-fir, or 130 cubic feet or 490 board feet for western larch. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Yellowbay soil is suited to ponderosa pine, Douglas-fir, and western larch. The site index is 100 for ponderosa pine, 60 for Douglas-fir, and 60 for western larch. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for ponderosa pine, 90 cubic feet or 320 board feet for Douglas-fir, or 90 cubic feet or 310 board feet for western larch. Potential production is estimated for an even-aged, fully stocked stand of trees.

7B--Waits Variant fine sandy loam, 0 to 4 percent slopes

This deep, well drained soil is on stream terraces in the northern part of the survey area. It formed in alluvium. Elevation is 2,000 to 2,400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of Selon Variant and Yellowbay soils. Also included are small areas of sloughs and Riverwash along the Kootenai River.

Typically, the surface layer is dark grayish brown fine sandy loam 5 inches thick. The subsurface layer is brown and yellowish brown fine sandy loam 13 inches thick. The subsoil is brown fine sandy loam 17 inches thick. The substratum to a depth of 60 inches is dark grayish brown fine sandy loam.

Permeability is moderately rapid, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this soil are used for woodland. A few areas are used for pasture.

Forest management

The Waits Variant soil is suited to Douglas-fir, ponderosa pine, and western larch. The site index is 60 for Douglas-fir, 85 for ponderosa pine, and 55 for western larch. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 75 cubic feet or 260 board feet for ponderosa pine, or 80 cubic feet or 260 board feet for western larch. Potential production is estimated for an even-aged, fully stocked stand of trees.

9B--Argenta Variant fine sandy loam, 0 to 2 percent slopes

This deep, somewhat poorly drained soil is on stream terraces in the Lake Creek vicinity. It formed in alluvium. Elevation is 2,200 to 2,400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Antero Variant, Selon Variant, and Yellowbay soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is gray fine sandy loam 6 inches thick. The subsoil is mainly olive gray sandy loam 22 inches thick. The upper 14 inches of the substratum is light olive gray very gravelly sandy loam. The lower part to a depth of 60 inches is light olive gray extremely gravelly sand.

Permeability is rapid, and available water capacity is low. Effective rooting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 36 to 60 inches in April through June. Sand and gravel are at a depth of 42 inches.

Most areas of this soil are used for woodland. A few areas are used for pasture and hayland.

Forest management

The Argenta Variant soil is suited to Engelmann spruce, western larch, Douglas-fir, and western redcedar. Yield estimates were not made.

10B--Glaciercreek gravelly silt loam, 0 to 4 percent slopes

This deep, well drained soil is on terraces throughout the survey area. It formed in alluvium with a surface mantle of volcanic ash influenced loess. Elevation is 1,800 to 2,600 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of Courville, Mission Variant, Selon Variant, and Yellowbay soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is dark yellowish brown very gravelly sandy loam 7 inches thick. The subsoil is light yellowish brown and yellowish brown extremely gravelly loamy sand 13 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sand.

Permeability is moderately rapid to a depth of 30 inches and rapid below this depth. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. Sand and gravel are at a depth of about 30 inches.

Most areas of this soil are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Glaciercreek soil is suited to Douglas-fir, western larch, ponderosa pine, and western white pine. The site index is 60 for Douglas-fir, 65 for western larch, 110 for ponderosa pine, and 65 for western white pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 360 board feet for western larch, 120 cubic feet or 485 board feet for ponderosa pine, or 130 cubic feet or 690 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

10C-Glaciercreek gravelly silt loam, 4 to 8 percent slopes

This deep, well drained soil is on terraces throughout the survey area. It formed in alluvium with a surface mantle of volcanic ash influenced loess. Elevation is 1,800 to 2,600 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of Courville, Mission Variant, Selon Variant, and Yellowbay soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is dark yellowish brown very gravelly sandy loam 7 inches thick. The subsoil is light yellowish brown and yellowish brown extremely gravelly loamy sand 13 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sand.

Permeability is moderately rapid to a depth of 30 inches and rapid below this depth. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. Sand and gravel are at a depth of about 30 inches.

This soil is used mainly for woodland.

Forest management

The Glaciercreek soil is suited to Douglas-fir, ponderosa pine, western larch, lodgepole pine, and western white pine. The site index is 60 for Douglas-fir, 110 for ponderosa pine, 65 for western larch, 100 for lodgepole pine, and 65 for western white pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 120 cubic feet or 485 board feet for ponderosa pine, 100 cubic feet or 360 board feet for western larch, 120 cubic feet or 425 board feet for lodgepole pine, or 130 cubic feet or 690 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

10D--Glaciercreek gravelly silt loam, 8 to 15 percent slopes

This deep, well drained soil is on terraces throughout the survey area. It formed in alluvium with a surface mantle of volcanic ash influenced loess. Elevation is 1,800 to 2,600 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of Courville, Mitten, and Selon Variant soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is dark yellowish brown very gravelly sandy loam 7 inches thick. The subsoil is light yellowish brown and yellowish brown extremely gravelly loamy sand 13 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sand.

Permeability is moderately rapid to a depth of 30 inches and rapid below this depth. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation. Sand and gravel are at a depth of about 30 inches.

This soil is used mainly for woodland.

Forest management

The Glaciercreek soil is suited to Douglas-fir, ponderosa pine, western larch, lodgepole pine, and western white pine. The site index is 60 for Douglas-fir, 110 for ponderosa pine, 65 for western larch, 100 for lodgepole pine, and 65 for western white pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 120 cubic feet or 485 board feet for ponderosa pine, 100 cubic feet or 360 board feet for western larch, 120 cubic feet or 425 board feet for lodgepole pine, or 130 cubic feet or 690 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

11B--Yellowbay gravelly sandy loam, 0 to 4 percent slopes

This deep, well drained soil is on terraces in the north-central part of the survey area. It formed in alluvium. Elevation is 1,800 to 2,400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of Glaciercreek and Selon Variant soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is brown gravelly sandy loam 8 inches thick. The subsoil is brown and dark brown very gravelly light sandy loam 18 inches thick. The substratum to a depth of 60 inches is dark yellowish brown and mainly extremely cobbly sand.

Permeability is rapid to a depth of 32 inches and very rapid below this depth. Effective rooting depth is about 32 inches. Runoff is slow, and the hazard of water erosion is slight.

This soil is used for woodland.

Forest management

The Yellowbay soil is suited to Douglas-fir, grand fir, ponderosa pine, western larch, and western white pine. The site index is 60 for Douglas-fir, 100 for ponderosa pine, and 60 for western larch. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 380 board feet for ponderosa pine, or 90 cubic feet or 310 board feet for western larch. Potential production is estimated for an even-aged, fully stocked stand of trees.

This unit as mapped on sheet 4 of 5 in parts of sections 5, 6, 31, and 32, townships 29 and 30 north, differs from the typical unit as follows:

1. It is traversed by gullies that potentially convey water during periods of heavy runoff.

2. Runoff water in the gullies and the effect the water may have on areas adjacent to the gullies could have an adverse influence on some land uses. Thus, onsite inspection, especially for homesite-related uses, should be made to determine the potential effect of water.

3. The slope range is 2 to 10 percent.

4. The texture of the surface layer includes very gravelly sand loam, very gravelly loam, and gravelly loam.

20B--McCaffery Variant-Selon Variant sandy loams, 0 to 6 percent slopes

This map unit is on terraces in the north-central part of the survey area. Elevation is 2,200 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 50 percent McCaffery Variant and 40 percent Selon Variant soils.

Included in this unit is about 10 percent Glaciercreek and Yellowbay soils.

The McCaffery Variant soil is deep and somewhat excessively drained. It formed in alluvium.

Typically, the surface of the McCaffery Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark brown sandy loam 6 inches thick. The subsoil is dark yellowish brown loamy sand 11 inches thick. The upper 25 inches of the substratum is dark grayish brown loamy sand. The lower part to a depth of 60 inches is dark grayish brown sand.

Permeability is moderately rapid to a depth of 40 inches and rapid below this depth. Available water capacity is low. Effective rooting depth is about 40 inches. Runoff is slow, and the hazard of water erosion is slight. This soil is calcareous below a depth of 17 inches.

The Selon Variant soil is deep and well drained. It formed in alluvium.

Typically, the surface of the Selon Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown sandy loam 11 inches thick. The subsurface layer is brown sandy loam 15 inches thick. The subsoil is dark brown sandy loam 26 inches thick. The substratum to a depth of 60 inches is dark grayish brown loamy sand.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for woodland. A few areas are used for hayland and pasture.

Forest management

The McCaffery Variant soil is suited to Douglas-fir, ponderosa pine, western larch, and western white pine. The site index is 55 for Douglas-fir, 95 for ponderosa pine, and 60 for western larch. The potential annual production (CMAI) per acre is about 80 cubic feet or 270 board feet (Scribner rule) for Douglas-fir, 95 cubic feet or 340 board feet for ponderosa pine, or 90 cubic feet or 310 board feet for western larch. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Selon Variant soil is suited to Douglas-fir, ponderosa pine, western larch, and western white pine. The site index is 60 for Douglas-fir, 105 for ponderosa pine, and 70 for western larch. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 105 cubic feet or 430 board feet for ponderosa pine, or 115 cubic feet or 425 board feet for western larch. Potential production is estimated for an even-aged, fully stocked stand of trees.

21B--Selon Variant very fine sandy loam, 0 to 4 percent slopes

This deep, well drained soil is on terraces in the central part of the survey area. It formed in alluvium. Elevation is 2,200 to 2,500 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Antero Variant and Mission Variant soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown very fine sandy loam 11 inches thick. The subsurface layer is brown fine sandy loam 15 inches thick. The subsoil is dark brown sandy loam 26 inches thick. The substratum to a depth of 60 inches is dark grayish brown loamy sand.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Selon Variant soil is suited to Douglas-fir, western larch, western white pine, grand fir, and ponderosa pine. The site index is 65 for Douglas-fir, 75 for western larch, 60 for western white pine, 50 for grand fir, and 115 for ponderosa pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 130 cubic feet or 490 board feet for western larch, 120 cubic feet or 625 board feet for western larch, 120 cubic feet or 625 board feet for western white pine, or 135 cubic feet or 540 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

21C--Selon Variant very fine sandy loam, 4 to 8 percent slopes

This deep, well drained soil is on terraces in the central part of the survey area. It formed in alluvium. Elevation is 2,200 to 2,500 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of McCaffery Variant and Mission Variant soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown very fine sandy loam 11 inches thick. The subsurface layer is brown fine sandy loam 15 inches thick. The subsoil is dark brown sandy loam 26 inches thick. The substratum to a depth of 60 inches is dark grayish brown loamy sand.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate if the soil is bare of vegetation.

Most areas of this unit are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Selon Variant soil is suited to Douglas-fir, western larch, western white pine, lodgepole pine, and ponderosa pine. The site index is 60 for Douglas-fir, 70 for western larch, 95 for lodgepole pine, and 105 for ponderosa pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 110 cubic feet or 400 board feet for lodgepole pine, or 105 cubic feet or 430 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

21E--Selon Variant very fine sandy loam, 15 to 35 percent slopes

This deep, well drained soil is on terrace edges in the north-central part of the survey area. It formed in alluvium and colluvium. Elevation is 2,200 to 2,500 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Entente Variant and McCaffery Variant soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown very fine sandy loam 11 inches thick. The subsurface layer is brown fine sandy loam 15 inches thick. The subsoil is dark brown sandy loam 26 inches thick. The substratum to a depth of 60 inches is dark grayish brown loamy sand.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Selon Variant soil is suited to Douglas-fir, ponderosa pine, western larch, western white pine, and grand fir. The site index is 65 for Douglas-fir, 115 for ponderosa pine, 75 for western larch, 60 for western white pine, and 50 for grand fir. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 135 cubic feet or 540 board feet for ponderosa pine, 130 cubic feet or 490 board feet for western larch, or 120 cubic feet or 625 board feet for western white pine.

30B--Half Moon silt loam, 0 to 6 percent slopes

This deep, well drained soil is on terraces in the northern part of the survey area. It formed in lacustrine. Elevation is 2,000 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of Glaciercreek, Selon Variant, and Yellowbay soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is brown silt loam 17 inches thick. The subsurface layer is brown and dark yellowish brown silt loam 4 inches thick. The subsoil is dark yellowish brown light silty clay loam 9 inches thick. The upper 12 inches of the substratum is light olive brown silt loam. The lower part to a depth of 60 inches is grayish brown loamy fine sand.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is calcareous below a depth of 25 inches.

Most areas of this soil are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Half Moon soil is suited to Douglas-fir, western larch, ponderosa pine, western white pine, and grand fir. The site index is 55 for Douglas-fir, 60 for western larch, and 85 for ponderosa pine. The potential annual production (CMAI) per acre is about 80 cubic feet or 270 board feet (Scribner rule) for Douglas-fir, 90 cubic feet or 310 board feet for western larch, or 75 cubic feet or 260 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

30E--Half Moon silt loam, 10 to 30 percent slopes

This deep, well drained soil is on terraces and terrace edges. It formed in lacustrine. Elevation is 2,000 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of Entente Variant, Selon Variant, and Yellowbay soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is brown silt loam 17 inches thick. The subsurface layer is brown and dark yellowish brown silt loam 4 inches thick. The subsoil is dark yellowish brown light silty clay loam 9 inches thick. The upper 12 inches of the substratum is light olive brown silt loam. The lower part to a depth of 60 inches is grayish brown loamy fine sand.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe if the soil is bare of vegetation.

Most areas of this soil are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Half Moon soil is suited to Douglas-fir, western larch, ponderosa pine, western white pine, lodgepole pine, and grand fir. The site index is 60 for Douglas-fir, 60 for western larch, 100 for ponderosa pine, 55 for western white pine, and 95 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 90 cubic feet or 310 board feet for western larch, 100 cubic feet or 380 board feet for ponderosa pine, 105 cubic feet or 550 board feet for western white pine, or 110 cubic feet or 400 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

31B--Mission Variant silt loam, 0 to 4 percent slopes

This deep, well drained soil is on terraces throughout the survey area. It formed in lacustrine with a mantle of volcanic ash influenced loess. Elevation is 2,000 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Savenac Variant and Selon Variant soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is light brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this soil are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Mission Variant soil is suited to Douglas-fir, grand fir, western larch, ponderosa pine, and western white pine. The site index is 65 for Douglas-fir, 50 for grand fir, 70 for western larch, 115 for ponderosa pine, and 60 for western white pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 135 cubic feet or 540 board feet for ponderosa pine, or 120 cubic feet or 625 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

31D--Mission Variant silt loam, 8 to 15 percent slopes

This deep, well drained soil is on terraces throughout the survey area. It formed in lacustrine with a mantle of volcanic ash influenced loess. Elevation is 2,000 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Courville, Entente Variant and Selon Variant soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is light brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This soil is used for woodland.

Forest management

The Mission Variant soil is suited to Douglas-fir, grand fir, western larch, ponderosa pine, and western white pine. The site index is 65 for Douglas-fir, 50 for grand fir, 70 for western larch, 115 for ponderosa pine, and 60 for western white pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 135 cubic feet or 540 board feet for ponderosa pine, or 120 cubic feet or 625 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

40C--Courville gravelly silt loam, 4 to 10 percent slopes

This deep, well drained soil is on foot slopes in the western and northern parts of the survey area. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess. Elevation is 2,000 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Glaciercreek, Kraft Variant, Mission Variant, and Mitten soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown gravelly silt loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This soil is used mainly for woodland.

Forest management

The Courville soil is suited to lodgepole pine, western larch, Douglas-fir, ponderosa pine, and western hemlock. The site index is 100 for lodgepole pine, 70 for western larch, 65 for Douglas-fir, and 110 for ponderosa pine. The potential annual production (CMAI) per acre is about 120 cubic feet or 425 board feet (Scribner rule) for lodgepole pine, 115 cubic feet or 425 board feet for western larch, 100 cubic feet or 380 board feet for Douglas-fir, or 120 cubic feet or 485 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

40D--Courville gravelly silt loam, 10 to 20 percent slopes

This deep, well drained soil is on foot slopes in the western and northern parts of the survey area. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess. Elevation is 2,000 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Glaciercreek, Kraft Variant, Mission Variant, and Mitten soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown gravelly silt loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This soil is used mainly for woodland.

Forest management

The Courville soil is suited to Douglas-fir, western larch, lodgepole pine, ponderosa pine, and western hemlock. The site index is 65 for Douglas-fir, 70 for western larch, 100 for lodgepole pine, and 110 for ponderosa pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 130 cubic feet or 490 board feet for western larch, 120 cubic feet or 425 board feet for lodgepole pine, or 120 cubic feet or 485 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

40E--Courville gravelly silt loam, 20 to 35 percent slopes

This deep, well drained soil is on foot slopes and sides of mountains in the western and northern parts of the survey area. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess. Elevation is 2,000 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Kraft Variant, Mitten, and Tevis soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown gravelly silt loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe if the soil is bare of vegetation.

This soil is used mainly for woodland.

Forest management

The Courville soil is suited to Douglas-fir, western larch, lodgepole pine, and ponderosa pine. The site index is 60 for Douglas-fir, 65 for western larch, 90 for lodgepole pine, and 105 for ponderosa pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 360 board feet for western larch, 105 cubic feet or 380 board feet for lodgepole pine, or 105 cubic feet or 430 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

100--Riverwash

Riverwash is along river channels. It includes gravel bars, low islands, and eroded flood plains that are nearly barren. Annual weeds and a few willows grow in the stable areas. Frequent flooding produces yearly changes in size and shape of areas of this land type. The alluvial material of these areas is mainly sand, loamy sand, gravelly sand, and sandy gravel. A thin layer of loam covers small spots in slack water areas.

131C--Mission Variant silt loam, till substratum, 3 to 10 percent slopes

This deep, well drained soil is on terraces in the central part of the survey area. It formed in lacustrine over loamy glacial till with a mantle of volcanic ash influenced loess. Elevation is 2,400 to 2,800 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Courville, Entente Variant, Kraft Variant, and Mission Variant soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray very gravelly loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This soil is used for woodland.

Forest management

The Mission Variant soil is suited to Douglas-fir, western larch, western white pine, grand fir, ponderosa pine, and lodgepole pine. The site index is 65 for Douglas-fir, 70 for western larch, 60 for western white pine, 50 for grand fir, 115 for ponderosa pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 120 cubic feet or 625 board feet for western white pine, 135 cubic feet or 540 board feet for ponderosa pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

131E--Kraft Variant-Mission Variant, till substratum, silt loams, 10 to 30 percent slopes

This map unit is on terraces and terrace edges in the central part of the survey area. Elevation is 2,400 to 2,800 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 50 percent Kraft Variant soil and 25 percent Mission Variant, till substratum, soil.

Included in this unit is about 25 percent Courville and Entente Variant soils.

The Kraft Variant soil is deep and well drained. It formed in lacustrine over loamy glacial till with a mantle of volcanic ash influenced loess.

Typically, the surface of the Kraft Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. Typically, the surface layer, when mixed to a depth of 7 inches, is yellowish brown silt loam. The subsurface layer is yellowish brown silt loam 15 inches thick. The upper 16 inches of the subsoil is pale brown and dark yellowish brown very gravelly loam. The lower 22 inches is light olive brown very gravelly light clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe if the soil is bare of vegetation.

The Mission Variant, till substratum, soil is deep and well drained. It formed in lacustrine over loamy glacial till with a mantle of volcanic ash influenced loess.

Typically, the surface of the Mission Variant, till substratum, soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray very gravelly loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Kraft Variant soil is suited to Douglas-fir, western larch, ponderosa pine, grand fir, and lodgepole pine. The site index is 60 for Douglas-fir, 60 for western larch, 95 for ponderosa pine, and 85 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 90 cubic feet or 310 board feet for western larch, 95 cubic feet or 340 board feet for ponderosa pine, or 95 cubic feet or 340 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Mission Variant soil is suited to Douglas-fir, western larch, ponderosa pine, grand fir, and lodgepole pine. The site index is 60 for Douglas-fir, 65 for western larch, 105 for ponderosa pine, and 95 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 360 board feet for western larch, 105 cubic feet or 430 board feet for ponderosa pine, or 110 cubic feet or 400 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

140F--Courville-Mitten gravelly silt loams, 30 to 60 percent slopes

This map unit is on sides of mountains in the western and eastern parts of the survey area. Elevation is 2,400 to 3,000 feet. The average annual precipitation is about 40 inches, the average annual air temperature is about 41 degrees F, and the average frost-free season is about 65 days.

This unit is about 45 percent Courville and 35 percent Mitten soils.

Included in this unit is about 20 percent Kraft Variant, Rock outcrop, Sharrott Variant, and Tevis soils.

The Courville soil is deep and well drained. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Courville soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown gravelly silt loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

The Mitten soil is deep and well drained. It formed in colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Mitten soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is brown very gravelly sandy loam 9 inches thick. The subsoil is yellowish brown and light olive brown extremely gravelly sandy loam 24 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Courville soil is suited to Douglas-fir, lodgepole pine, western larch, and ponderosa pine. The site index is 65 for Douglas-fir, 100 for lodgepole pine, 70 for western larch, and 110 for ponderosa pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 120 cubic feet or 425 board feet for lodgepole pine, 115 cubic feet or 425 board feet for western larch, or 120 cubic feet or 485 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Mitten soil is suited to Douglas-fir, lodgepole pine, western larch, and ponderosa pine. The site index is 60 for Douglas-fir, 85 for lodgepole pine, 60 for western larch, and 95 for ponderosa pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 95 cubic feet or 340 board feet for lodgepole pine, 90 cubic feet or 310 board feet for western larch, or 95 cubic feet or 340 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

150E--Mitten-Courville gravelly silt loams, 10 to 30 percent slopes

This map unit is on sides of mountains and on foot slopes in the northern part of the survey area. Elevation is 2,000 to 3,000 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 55 percent Mitten and 30 percent Courville soils. The Mitten soils are on the sides of mountains, and the Courville soils are on foot slopes.

Included in this unit are small areas of Rock outcrop and Sharrott Variant and Tevis soils. Included areas make up about 15 percent of the total acreage.

The Mitten soil is deep and well drained. It formed in colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Mitten soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is brown very gravelly sandy loam 9 inches thick. The subsoil is yellowish brown and light olive brown extremely gravelly sandy loam 24 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

The Courville soil is deep and well drained. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Courville soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown gravelly silt loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Mitten soil is suited to Douglas-fir, western larch, grand fir, western white pine, ponderosa pine, and lodgepole pine. The site index is 60 for Douglas-fir, 60 for western larch, 95 for ponderosa pine, and 85 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 90 cubic feet or 310 board feet for western larch, 95 cubic feet or 340 board feet for ponderosa pine, or 95 cubic feet or 340 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Courville soil is suited to Douglas-fir, western larch, grand fir, western white pine, ponderosa pine, and lodgepole pine. The site index is 60 for Douglas-fir, 65 for western larch, 105 for ponderosa pine, and 90 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 360 board feet for western larch, 105 cubic feet or 430 board feet for ponderosa pine, or 105 cubic feet or 380 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

150F--Mitten-Courville gravelly silt loams, 30 to 60 percent slopes

This map unit is on sides of mountains throughout the survey area. Elevation is 2,000 to 3,000 feet. The average annual precipitation is about 40 inches, the average annual air temperature is about 42 degrees F, and the average frost-free season is about 65 days.

This unit is about 55 percent Mitten and 30 percent Courville soils.

Included in this unit are small areas of Rock outcrop and Sharrott Variant and Tevis soils. Included areas make up about 15 percent of the total acreage.

The Mitten soil is deep and well drained. It formed in colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Mitten soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is brown very gravelly sandy loam 9 inches thick. The subsoil is yellowish brown and light olive brown extremely gravelly sandy loam 24 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

The Courville soil is deep and well drained. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Courville soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown gravelly silt loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Mitten soil is suited to Douglas-fir, western larch, grand fir, western white pine, ponderosa pine, and lodgepole pine. The site index is 60 for Douglas-fir, 60 for western larch, 95 for ponderosa pine, and 85 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 90 cubic feet or 310 board feet for western larch, 95 cubic feet or 340 board feet for ponderosa pine, or 95 cubic feet or 340 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Courville soil is suited to Douglas-fir, western larch, grand fir, western white pine, ponderosa pine, and lodgepole pine. The site index is 60 for Douglas-fir, 65 for western larch, 105 for ponderosa pine, and 90 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 360 board feet for western larch, 105 cubic feet or 430 board feet for ponderosa pine, or 105 cubic feet or 380 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

152G--Sharrott Variant-Mitten-Rock outcrop complex, 45 to 75 percent slopes

This map unit is on sides of mountains in the vicinity of Copper and McConnel Mountains in the western and eastern parts of the survey area. Elevation is 2,600 to 3,000 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 70 days.

This unit is about 35 percent Sharrott Variant gravelly loam, 35 percent Mitten gravelly silt loam, and 20 percent Rock outcrop.

The Sharrott Variant soil is shallow and somewhat excessively drained. It formed in residuum from argillite and quartzite rock.

Typically, the surface of the Sharrott Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly loam 3 inches thick. The subsurface layer is yellowish brown very gravelly loam 5 inches thick. The subsoil is yellowish brown extremely gravelly sandy loam 10 inches thick. Below this, to a depth of 60 inches, is bedrock.

Permeability is moderately rapid, and available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation. Bedrock is at a depth of 12 to 20 inches.

The Mitten soil is deep and well drained. It formed in colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Mitten soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is brown very gravelly sandy loam 9 inches thick. The subsoil is yellowish brown and light olive brown extremely gravelly sandy loam 24 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation. The Rock outcrop is mainly barren exposure of argillite and quartzite rock.

This unit is used for woodland.

Forest management

The Sharrott Variant soil is suited to Douglas-fir and ponderosa pine. The site index is 40 for Douglas-fir and 65 for ponderosa pine. The potential annual production (CMAI) per acre is about 50 cubic feet or 160 board feet (Scribner rule) for Douglas-fir or 45 cubic feet or 140 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Mitten soil is suited to Douglas-fir, lodgepole pine, western larch, and ponderosa pine. The site index is 55 for Douglas-fir, 80 for lodgepole pine, 55 for western larch, and 90 for ponderosa pine. The potential annual production (CMAI) per acre is about 80 cubic feet or 270 board feet (Scribner rule) for Douglas-fir, 85 cubic feet or 300 board feet for lodgepole pine, 80 cubic feet or 260 board feet for western larch, or 80 cubic feet or 300 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

161F--Tevis-Yellowbay very gravelly sandy loams, 30 to 60 percent slopes

This map unit is on terrace edges in the northern part of the survey area. Elevation is 2,000 to 2,400 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 80 days.

This unit is about 45 percent Tevis soil and 45 percent Yellowbay soil.

Included in this unit is about 10 percent Glaciercreek, Mitten, and Sharrott Variant soils. Also included are small areas of Rock outcrop.

The Tevis soil is deep and well drained. It formed in colluvium from argillite and quartzite rock.

Typically, the surface of the Tevis soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is yellowish brown very gravelly sandy loam 9 inches thick. The subsurface layer is brown and yellowish brown very gravelly loam 21 inches thick. The subsoil is dark brown and brown extremely gravelly loam 9 inches thick. The substratum to a depth of 60 inches is dark brown extremely gravelly sandy loam.

Permeability is moderate, and available water capacity is low. Effective rooting depth is about 48 inches. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

The Yellowbay soil is deep and well drained. It formed in alluvium.

Typically, the surface of the Yellowbay soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is brown very gravelly sandy loam 8 inches thick. The subsoil is brown and dark brown very gravelly light sandy loam 18 inches thick. The substratum to a depth of 60 inches is dark yellowish brown and mainly extremely cobbly sand.

Permeability is rapid to a depth of 32 inches and very rapid below this depth. Effective rooting depth is about 32 inches. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Tevis soil is suited to ponderosa pine, western larch, lodgepole pine, and Douglas-fir. The site index is 90 for ponderosa pine, 55 for western larch, and 55 for Douglas-fir. The potential annual production (CMAI) per acre is about 80 cubic feet or 300 board feet (Scribner rule) for ponderosa pine, 80 cubic feet or 260 board feet for western larch, or 80 cubic feet or 270 board feet for Douglas-fir. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Yellowbay soil is suited to ponderosa pine, western larch, lodgepole pine, and Douglas-fir. The site index is 85 for ponderosa pine, 50 for western larch, and 50 for Douglas-fir. The potential annual production (CMAI) per acre is about 75 cubic feet or 260 board feet (Scribner rule) for ponderosa pine, 70 cubic feet or 220 board feet for western larch, or 70 cubic feet or 230 board feet for Douglas-fir. Potential production is estimated for an even-aged, fully stocked stand of trees.

162F--McCaffery Variant-Selon Variant sandy loams, 30 to 60 percent slopes

This map unit is on terrace edges in the north-central part of the survey area. Elevation is 2,200 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 55 percent McCaffery Variant and 25 percent Selon Variant soils.

Included in this unit is about 20 percent Entente Variant and Yellowbay soils.

The McCaffery Variant soil is deep and somewhat excessively drained. It formed in alluvium.

Typically, the surface of the McCaffery Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark brown sandy loam 6 inches thick. The subsoil is dark yellowish brown loamy sand 11 inches thick. The upper 25 inches of the substratum is dark grayish brown loamy sand. The lower part to a depth of 60 inches is dark grayish brown sand.

Permeability is moderately rapid to a depth of 40 inches and rapid below this depth. Available water capacity is low. Effective rooting depth is about 40 inches. Runoff is medium, and the hazard of water erosion is severe if the soil is bare of vegetation. This soil is calcareous below a depth of 17 inches.

The Selon Variant soil is deep and well drained. It formed in alluvium.

Typically, the surface of the Selon Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown sandy loam 11 inches thick. The subsurface layer is brown sandy loam 15 inches thick. The subsoil is dark brown sandy loam 26 inches thick. The substratum to a depth of 60 inches is dark grayish brown loamy sand.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The McCaffery Variant soil is suited to Douglas-fir, western larch, grand fir, western white pine, and ponderosa pine. The site index is 55 for Douglas-fir, 60 for western larch, and 100 for ponderosa pine. The potential annual production (CMAI) per acre is about 80 cubic feet or 270 board feet (Scribner rule) for Douglas-fir, 90 cubic feet or 310 board feet for western larch, or 100 cubic feet or 380 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Selon Variant soil is suited to Douglas-fir, western larch, grand fir, western white pine, and ponderosa pine. The site index is 60 for Douglas-fir, 70 for western larch, 45 for grand fir, 55 for western white pine, and 110 for ponderosa pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 105 cubic feet or 550 board feet for western white pine, or 120 cubic feet or 485 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

163F--Glaciercreek-Yellowbay complex, 30 to 60 percent slopes

This map unit is on terrace edges in the central and northern parts of the survey area. Elevation is 2,000 to 2,300 feet. The average annual precipitation is about 30 inches, the average annual air temperature is about 45 degrees F, and the average frost-free season is about 80 days.

This unit is aobut 40 percent Glaciercreek gravelly silt loam and 40 percent Yellowbay gravelly sandy loam soils.

Included in this unit is about 20 percent Entente Variant, Mission Variant, and Selon Variant soils.

The Glaciercreek soil is deep and well drained. It formed in alluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Glaciercreek soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is dark yellowish brown very gravelly sandy loam 7 inches thick. The subsoil is light yellowish brown and yellowish brown extremely gravelly loamy sand 13 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sand.

Permeability is moderately rapid to a depth of 30 inches and rapid below this depth. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation. Sand and gravel are at a depth of about 30 inches.

The Yellowbay soil is deep and well drained. It formed in alluvium.

Typically, the surface of the Yellowbay soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is brown gravelly sandy loam 8 inches thick. The subsoil is brown and dark brown very gravelly light sandy loam 18 inches thick. The substratum to a depth of 60 inches is dark yellowish brown and mainly extremely cobbly sand.

Permeability is rapid to a depth of 32 inches and very rapid below this depth. Effective rooting depth is about 32 inches. Runoff is medium, and the hazard of water erosion is severe if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Glaciercreek soil is suited to Douglas-fir, lodgepole pine, western larch, and ponderosa pine. The site index is 55 for Douglas-fir, 90 for lodgepole pine, 60 for western larch, and 95 for ponderosa pine. The potential annual production (CMAI) per acre is about 80 cubic feet or 270 board feet (Scribner rule) for Douglas-fir, 105 cubic feet or 380 board feet for lodgepole pine, 90 cubic feet or 310 board feet for western larch, or 95 cubic feet or 340 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Yellowbay soil is suited to Douglas-fir, lodgepole pine, western larch, and ponderosa pine. The site index is 55 for Douglas-fir, 90 for lodgepole pine, 60 for western larch, and 90 for ponderosa pine. The potential annual production (CMAI) per acre is about 80 cubic feet or 270 board feet (Scribner rule) for Douglas-fir, 105 cubic feet or 380 board feet for lodgepole pine, 90 cubic feet or 310 board feet for western larch, or 80 cubic feet or 300 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

164E--Entente Variant-Selon Variant complex, 15 to 35 percent slopes

This map unit is on terrace edges in the central part of the survey area. Elevation is 2,000 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 50 percent Entente silt loam and 35 percent Selon very fine sandy loam.

Included in this unit is about 15 percent McCaffery Variant, Mission Variant, and Yellowbay soils.

The Entente Variant soil is deep and well drained. It formed in lacustrine.

Typically, the surface of the Entente Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is brown silt loam 6 inches thick. The subsurface layer is brownish gray silt loam 8 inches thick. The subsoil to a depth of 60 inches is light brownish gray and yellowish brown silt loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe if the soil is bare of vegetation.

The Selon Variant soil is deep and well drained. It formed in alluvium and colluvium.

Typically, the surface of the Selon Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown very fine sandy loam 11 inches thick. The subsurface layer is brown fine sandy loam 15 inches thick. The subsoil is dark brown sandy loam 26 inches thick. The substratum to a depth of 60 inches is dark grayish brown loamy sand.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Entente Variant soil is suited to Douglas-fir, western larch, grand fir, western white pine, lodgepole pine, and ponderosa pine. The site index is 65 for Douglas-fir, 70 for western larch, and 115 for ponderosa pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, or 135 cubic feet or 540 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Selon Variant soil is suited to Douglas-fir, western larch, grand fir, western white pine, lodgepole pine, and ponderosa pine. The site index is 60 for Douglas-fir, 75 for western larch, 50 for grand fir, 60 for western white pine, 100 for lodgepole pine, and 115 for ponderosa pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 130 cubic feet or 490 board feet for western larch, 120 cubic feet or 625 board feet for western white pine, 120 cubic feet or 425 board feet for lodgepole pine, or 135 cubic feet or 540 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

165F--Half Moon silt loam, 30 to 60 percent slopes

This deep, well drained soil is on terrace edges in the northern part of the survey area. It formed in lacustrine. Elevation is 2,000 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 80 days.

Included in this unit are small areas of deep soils that are calcareous throughout and small severely eroded soils similar to the Half Moon series.

Typically, the surface is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is brown silt loam 17 inches thick. The subsurface layer is brown and dark yellowish brown silt loam 4 inches thick. The subsoil is dark yellowish brown light silty clay loam 9 inches thick. The upper 12 inches of the substratum is light olive brown silt loam. The lower part to a depth of 60 inches is grayish brown loamy fine sand.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation. This soil is calcareous below a depth of 25 inches.

Most areas of this soil are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Half Moon soil is suited to ponderosa pine, western larch, and Douglas-fir. The site index is 80 for ponderosa pine, 55 for western larch, and 50 for Douglas-fir. The potential annual production (CMAI) per acre is about 70 cubic feet or 230 board feet (Scribner rule) for ponderosa pine, 80 cubic feet or 260 board feet for western larch, or 70 cubic feet or 230 board feet for Douglas-fir. Potential production is estimated for an even-aged, fully stocked stand of trees.

200--Rubble land

This map unit consists of areas with more than 90 percent of the surface occupied by cobbles, stones, or boulders. The areas are commonly at the base of mountain slopes or below areas of Rock outcrop.

210D--Glaciercreek-Courville gravelly silt loams, 6 to 15 percent slopes

This map unit is on terraces and foot slopes throughout the survey area. Elevation is 2,000 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 75 days.

This unit is about 45 percent Glaciercreek and 40 percent Courville soils. The Glaciercreek soil is on terraces, and the Courville soil is on foot slopes.

Included in this unit is about 15 percent Mitten, Selon Variant, and Yellowbay soils.

The Glaciercreek soil is deep and well drained. It formed in alluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Glaciercreek soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is dark yellowish brown very gravelly sandy loam 7 inches thick. The subsoil is light yellowish brown and yellowish brown extremely gravelly loamy sand 13 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sand.

Permeability is moderately rapid to a depth of 30 inches and rapid below this depth. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation. Sand and gravel are at a depth of about 30 inches.

The Courville soil is deep and well drained. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Courville soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown gravelly silt loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This unit is used mainly for woodland.

Forest management

The Glaciercreek soil is suited to Douglas-fir, lodgepole pine, western larch, ponderosa pine, grand fir, and western white pine. The site index is 60 for Douglas-fir, 100 for lodgepole pine, 65 for western larch, 110 for ponderosa pine, and 65 for western white pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 120 cubic feet or 425 board feet for lodgepole pine, 100 cubic feet or 360 board feet for western larch, 120 cubic feet or 485 board feet for ponderosa pine, or 130 cubic feet or 690 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Courville soil is suited to Douglas-fir, lodgepole pine, western larch, ponderosa pine, grand fir, and western white pine. The site index is 65 for Douglas-fir, 100 for lodgepole pine, 70 for western larch, 110 for ponderosa pine, and 65 for western white pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 380 board feet for Douglas-fir, 120 cubic feet or 425 board feet for lodgepole pine, 115 cubic feet or 425 board feet for western larch, 120 cubic feet or 485 board feet for ponderosa pine, or 130 cubic feet or 690 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

210E--Glaciercreek-Courville gravelly silt loams, 15 to 35 percent slopes

This map unit is on terraces and foot slopes throughout the survey area. Elevation is 2,000 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 75 days.

This unit is about 45 percent Glaciercreek and 40 percent Courville soils. The Glaciercreek soil is on terrace edges, and the Courville soil is on foot slopes.

Included in this unit is about 15 percent Courville stony silt loam, Mitten, and Yellowbay soils.

The Glaciercreek soil is deep and well drained. It formed in alluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Glaciercreek soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is dark yellowish brown very gravelly sandy loam 7 inches thick. The subsoil is light yellowish brown and yellowish brown extremely gravelly loamy sand 13 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sand.

Permeability is moderately rapid to a depth of 30 inches and rapid below this depth. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation. Sand and gravel are at a depth of about 30 inches.

The Courville soil is deep and well drained. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Courville soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown gravelly silt loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This unit is used mainly for woodland.

Forest management

The Glaciercreek soil is suited to Douglas-fir, lodgepole pine, western larch, ponderosa pine, grand fir, and western white pine. The site index is 60 for Douglas-fir, 100 for lodgepole pine, 65 for western larch, 110 for ponderosa pine, and 65 for western white pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 120 cubic feet or 425 board feet for lodgepole pine, 100 cubic feet or 360 board feet for western larch, 120 cubic feet or 485 board feet for ponderosa pine, or 130 cubic feet or 690 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Courville soil is suited to Douglas-fir, lodgepole pine, western larch, ponderosa pine, grand fir, and western white pine. The site index is 65 for Douglas-fir, 100 for lodgepole pine, 70 for western larch, 110 for ponderosa pine, and 65 for western white pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 380 board feet for Douglas-fir, 120 cubic feet or 425 board feet for lodgepole pine, 115 cubic feet or 425 board feet for western larch, 120 cubic feet or 485 board feet for ponderosa pine, or 130 cubic feet or 690 board feet for western white pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

231B--Mission Variant-Somers Variant silt loams, 0 to 6 percent slopes

This map unit is on terraces in the central part of the survey area. Elevation is 2,300 to 2,400 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 80 days.

This unit is about 55 percent Mission Variant and 25 percent Somers Variant soils.

Included in this unit are small areas of Savenac Variant and Selon Variant soils. Also included are small areas of Mission Variant soils that have a seasonal high water table at 4 to 6 feet. Included areas make up about 20 percent of the total acreage.

The Mission Variant soil is deep and well drained. It formed in lacustrine with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Mission Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is light brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The Somers Variant soil is deep and poorly drained. It formed in alluvium.

Typically, the surface of the Somers Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is very dark gray silt loam 3 inches thick. The subsurface layer is gray silt loam 5 inches thick. The subsoil is dark grayish brown silt loam 10 inches thick. The substratum to a depth of 60 inches is olive gray silt loam and very fine sandy loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is about 36 inches. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 10 to 30 inches in April through June.

This unit is used for woodland.

Forest management

The Mission Variant soil is suited to western larch, Engelmann spruce, grand fir, Douglas-fir, western white pine, and lodgepole pine. The site index is 75 for western larch, 50 for grand fir, 70 for Douglas-fir, 65 for western white pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 130 cubic feet or 490 board feet (Scribner rule) for western larch, 110 cubic feet or 400 board feet for Douglas-fir, 130 cubic feet or 690 board feet for western white pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Somers Variant soil is suited to Engelmann spruce and western redcedar. Yield estimates were not made.

250F--Mitten-Sharrott Variant complex, 35 to 60 percent slopes

This map unit is on sides of mountains in scattered tracts along the edges of the soil survey area. Elevation is 2,000 to 4,000 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 50 percent Mitten gravelly silt loam and 30 percent Sharrott Variant gravelly loam.

Included in this unit is about 20 percent Tevis soils and Rock outcrop.

The Mitten soil is deep and well drained. It formed in colluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Mitten soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is brown very gravelly sandy loam 9 inches thick. The subsoil is yellowish brown and light olive brown extremely gravelly sandy loam 24 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

The Sharrott Variant soil is shallow and somewhat excessively drained. It formed in residuum from argillite and quartzite rock.

Typically, the surface of the Sharrott Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly loam 3 inches thick. The subsurface layer is yellowish brown very gravelly loam 5 inches thick. The subsoil is yellowish brown extremely gravelly sandy loam 10 inches thick. Below this, to a depth of 60 inches, is bedrock.

Permeability is moderately rapid, and available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation. Bedrock is at a depth of 12 to 20 inches.

This unit is used for woodland.

Forest management

The Mitten soil is suited to Douglas-fir, grand fir, ponderosa pine, western larch, and lodgepole pine. The site index is 60 for Douglas-fir, 95 for ponderosa pine, 60 for western larch, and 85 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 95 cubic feet or 340 board feet for ponderosa pine, 90 cubic feet or 310 board feet for western larch, or 95 cubic feet or 340 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Sharrott soil is suited to Douglas-fir and ponderosa pine. The site index is 40 for Douglas-fir and 65 for ponderosa pine. The potential annual production (CMAI) per acre is about 50 cubic feet or 160 board feet (Scribner rule) for Douglas-fir or 45 cubic feet or 140 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

252G--Sharrott Variant-Rock outcrop-Tevis complex, warm, 45 to 75 percent slopes

This map unit is on warm and dry south- and west-exposed sides of mountains in scattered tracts along the edges of the soil survey area. Elevation is 2,000 to 4,000 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 35 percent Sharrott Variant gravelly loam, 30 percent Rock outcrop, and 25 percent Tevis gravelly loam.

Included in this unit is about 10 percent Courville and Mitten soils.

The Sharrott Variant soil is shallow and somewhat excessively drained. It formed in residuum from argillite and quartzite rock.

Typically, the surface of the Sharrott Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly loam 3 inches thick. The subsurface layer is yellowish brown very gravelly loam 5 inches thick. The subsoil is yellowish brown extremely gravelly sandy loam 10 inches thick. Below this, to a depth of 60 inches, is bedrock.

Permeability is moderately rapid, and available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation. Bedrock is at a depth of 12 to 20 inches.

The Rock outcrop is mainly barren exposures of argillite and quartzite rock.

The Tevis soil is deep and well drained. It formed in colluvium from argillite and quartzite rock.

Typically, the surface of the Tevis soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is yellowish brown gravelly loam 9 inches thick. The subsurface layer is brown and yellowish brown very gravelly loam 21 inches thick. The subsoil is dark brown and brown extremely gravelly loam 9 inches thick. The substratum to a depth of 60 inches is dark brown extremely gravelly sandy loam.

Permeability is moderate, and available water capacity is low. Effective rooting depth is about 48 inches. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Sharrott Variant soil is suited to Douglas-fir and ponderosa pine. The site index is 35 for Douglas-fir and 60 for ponderosa pine. The potential annual production (CMAI) per acre is about 45 cubic feet or 135 board feet (Scribner rule) for Douglas-fir or 40 cubic feet or 130 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Tevis soil is suited to Douglas-fir, ponderosa pine, and lodgepole pine. The site index is 50 for Douglas-fir and 80 for ponderosa pine. The potential annual production (CMAI) per acre is about 70 cubic feet or 230 board feet (Scribner rule) for Douglas-fir or 70 cubic feet or 230 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

300--Pits, gravel

This map unit consists of open excavations from which the soil and underlying gravel material have been removed, exposing rock or other material that supports few or no plants.

331B--Savenac Variant-Mission Variant silt loams, 0 to 3 percent slopes

This map unit is on terraces in the central part of the survey area. Elevation is 2,200 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 50 percent Savenac Variant and 45 percent Mission Variant soils.

Included in this unit is about 5 percent Entente Variant soil.

The Savenac Variant soil is deep and well drained. It formed in lacustrine with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Savenac Variant soil is covered with a mat of partially decomposed forest litter 3 inches thick. The surface layer is brown silt loam 11 inches thick. The subsurface layer is very pale brown silt loam 8 inches thick. The upper 13 inches of the subsoil is light yellowish brown heavy silt loam. The lower 40 inches is light yellowish brown and pale brown silty clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The Mission Variant soil is deep and well drained. It formed in lacustrine with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Mission Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is light brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Savenac Variant soil is suited to western larch, Douglas-fir, grand fir, western white pine, ponderosa pine, and lodgepole pine. The site index is 70 for western larch, 65 for Douglas-fir, 50 for grand fir, 60 for western white pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 115 cubic feet or 425 board feet (Scribner rule) for western larch, 100 cubic feet or 380 board feet for Douglas-fir, 120 cubic feet or 625 board feet for western white pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Mission Variant soil is suited to western larch, Douglas-fir, grand fir, western white pine, ponderosa pine, and lodgepole pine. The site index is 75 for western larch, 70 for Douglas-fir, 50 for grand fir, 65 for western white pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 130 cubic feet or 490 board feet (Scribner rule) for western larch, 110 cubic feet or 440 board feet for Douglas-fir, 130 cubic feet or 690 board feet for western white pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

331C--Savenac Variant-Mission Variant silt loams, 3 to 10 percent slopes

This map unit is on terraces in the central part of the survey area. Elevation is 2,200 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

This unit is about 50 percent Savenac Variant and 45 percent Mission Variant soils.

Included in this unit is about 5 percent Entente Variant soil.

The Savenac Variant soil is deep and well drained. It formed in lacustrine with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Savenac Variant soil is covered with a mat of partially decomposed forest litter 3 inches thick. The surface layer is brown silt loam 11 inches thick. The subsurface layer is very pale brown silt loam 8 inches thick. The upper 13 inches of the subsoil is light yellowish brown heavy silt loam. The lower 40 inches is light yellowish brown and pale brown silty clay loam.

Permeability is slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

The Mission Variant soil is deep and well drained. It formed in lacustrine with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Mission Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is light brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

Most areas of this unit are used for woodland. A few areas are used for hayland and pasture.

Forest management

The Savenac Variant soil is suited to western larch, Douglas-fir, grand fir, western white pine, ponderosa pine, and lodgepole pine. The site index is 70 for western larch, 65 for Douglas-fir, 50 for grand fir, 60 for western white pine, 115 for ponderosa pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 115 cubic feet or 425 board feet (Scribner rule) for western larch, 100 cubic feet or 380 board feet for Douglas-fir, 120 cubic feet or 625 board feet for western white pine, 135 cubic feet or 540 board feet for ponderosa pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Mission Variant soil is suited to western larch, Douglas-fir, grand fir, western white pine, ponderosa pine, and lodgepole pine. The site index is 70 for western larch, 65 for Douglas-fir, 45 for grand fir, 60 for western white pine, 115 for ponderosa pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 115 cubic feet or 425 board feet (Scribner rule) for western larch, 100 cubic feet or 380 board feet for Douglas-fir, 120 cubic feet or 625 board feet for western white pine, 135 cubic feet or 540 board feet for ponderosa pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

340D-Courville stony loam, 10 to 20 percent slopes

This deep, well drained soil is on foot slopes in the southeastern part of the survey area. It formed in glacial till and colluvium with a surface mantle of volcanic ash influenced loess. Elevation is 2,000 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 75 days.

Included in this unit are small areas of Glaciercreek and Mitten soils.

Typically, the surface is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark brown stony loam 8 inches thick. The subsurface layer is brown and dark yellowish brown very gravelly sandy loam 12 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown and brown very gravelly loam.

Permeability is moderate, and available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate if the soil is bare of vegetation.

This soil is used mainly for woodland.

Forest management

The Courville soil is suited to Douglas-fir, grand fir, western larch, western white pine, and lodgepole pine. The site index is 65 for Douglas-fir, 70 for western larch, 65 for western white pine, and 110 for lodgepole pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 130 cubic feet or 690 board feet for western white pine, or 130 cubic feet or 450 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

350C--Mitten-Mission Variant complex, 3 to 10 percent slopes

This map unit is on foot slopes and terraces in the central part of the survey area. Elevation is 2,200 to 2,600 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 70 days.

This unit is about 50 percent Mitten gravelly silt loam and 30 percent Mission Variant silt loam. The Mitten soils are on foot slopes and the Mission Variant soils are on terraces.

Included in this unit are small areas of Savenac Variant and Sharrott Variant soils. Also included are small areas of wet soils in depressional areas and areas with boulders on the surface. Included areas make up about 20 percent of the total acreage.

The Mitten soil is deep and well drained. It formed in colluvium with a mantle of volcanic ash influenced loess.

Typically, the surface of the Mitten soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is brown very gravelly sandy loam 9 inches thick. The subsoil is yellowish brown and light olive brown extremely gravelly sandy loam 24 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The Mission Variant soil is deep and well drained. It formed in lacustrine with a mantle of volcanic ash influenced loess.

Typically, the surface of the Mission Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is light brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for woodland.

Forest management

The Mitten soil is suited to Douglas-fir, western larch, grand fir, western white pine, Engelmann spruce, and lodgepole pine. The site index is 65 for Douglas-fir, 70 for western larch, 50 for grand fir, 65 for western white pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 130 cubic feet or 690 board feet for western white pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Mission Variant soil is suited to Douglas-fir, western larch, grand fir, western white pine, Engelmann spruce, and lodgepole pine. The site index is 70 for Douglas-fir, 75 for western larch, 50 for grand fir, 65 for western white pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 110 cubic feet or 440 board feet (Scribner rule) for Douglas-fir, 130 cubic feet or 490 board feet for western larch, 130 cubic feet or 690 board feet for western white pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

350G--Mitten-Entente Variant complex, 45 to 75 percent slopes

This map unit is on sides of mountains and terrace edges in the central part of the survey area. Elevation is 2,100 to 2,800 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 43 degrees F, and the average frost-free season is about 70 days.

This unit is about 55 percent Mitten gravelly silt loam and 25 percent Entente Variant silt loam. The Mitten soils are on sides of mountains, and the Entente Variant soils are on terrace edges.

Included in this unit is about 20 percent McCaffery Variant, Sharrott Variant, and Tevis soils and Rock outcrop.

The Mitten soil is deep and well drained. It formed in colluvium with a mantle of volcanic ash influenced loess.

Typically, the surface of the Mitten soil is covered with a mat of partially decomposed forest litter 1 inch thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is brown very gravelly sandy loam 9 inches thick. The subsoil is yellowish brown and light olive brown extremely gravelly sandy loam 24 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sandy loam.

Permeability is moderately rapid, and available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

The Entente Variant soil is deep and well drained. It formed in lacustrine.

Typically, the surface of the Entente Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is brown silt loam 6 inches thick. The subsurface layer is brownish gray silt loam 8 inches thick. The subsoil to a depth of 60 inches is light brownish gray and yellowish brown silt loam.

Permeability is moderate, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is severe if the soil is bare of vegetation.

This unit is used for woodland.

Forest management

The Mitten soil is suited to Douglas-fir, western larch, grand fir, lodgepole pine, and ponderosa pine. The site index is 60 for Douglas-fir, 60 for western larch, 85 for lodgepole pine, and 95 for ponderosa pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 90 cubic feet or 310 board feet for western larch, 95 cubic feet or 340 board feet for lodgepole pine, or 95 cubic feet or 340 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Entente Variant soil is suited to Douglas-fir, western larch, grand fir, lodgepole pine, and ponderosa pine. The site index is 60 for Douglas-fir, 65 for western larch, and 105 for ponderosa pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 90 cubic feet or 310 board feet for western larch, or 105 cubic feet or 430 board feet for ponderosa pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

400--Rock outcrop

Rock outcrop is a miscellaneous land type that occurs throughout the survey area in the uplands. It is mainly on ridgetops, along canyon rims, and on steep mountain slopes. It consists mainly of bare bedrock, but in some places less than 10 inches of soil material is over the bedrock.

Rock outcrop is used for wildlife habitat and recreation.

431B--Mission Variant-Glaciercreek-Kraft Variant complex, 0 to 4 percent slopes

This map unit is on terraces in the northern part of the survey area. Elevation is 2,000 to 2,500 feet. The average annual precipitation is about 35 inches, the average annual air temperature is about 44 degrees F, and the average frost-free season is about 80 days.

This unit is about 40 percent Mission Variant silt loam, 25 percent Glaciercreek gravelly silt loam, and 20 percent Kraft Variant silt loam.

Included in this unit is about 15 percent Entente Variant soil.

The Mission Variant soil is deep and well drained. It formed in lacustrine with a mantle of volcanic ash influenced loess.

Typically, the surface of the Mission Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown silt loam 13 inches thick. The subsurface layer is light brownish gray silt loam 10 inches thick. The subsoil is light brownish gray and light olive brown silt loam 13 inches thick. The substratum to a depth of 60 inches is light brownish gray silt loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The Glaciercreek soil is deep and well drained. It formed in alluvium with a surface mantle of volcanic ash influenced loess.

Typically, the surface of the Glaciercreek soil is covered with a mat of partially decomposed forest litter 2 inches thick. The surface layer is dark yellowish brown gravelly silt loam 10 inches thick. The subsurface layer is dark yellowish brown very gravelly sandy loam 7 inches thick. The subsoil is light yellowish brown and yellowish brown extremely gravelly loamy sand 13 inches thick. The substratum to a depth of 60 inches is yellowish brown extremely gravelly sand.

Permeability is moderately rapid to a depth of 30 inches and rapid below this depth. Available water capacity is very low. Effective rooting depth is about 30 inches. Runoff is slow, and the hazard of water erosion is slight. Sand and gravel are at a depth of about 30 inches.

The Kraft Variant soil is deep and well drained. It formed in lacustrine over loamy glacial till with a mantle of volcanic ash influenced loess.

Typically, the surface of the Kraft Variant soil is covered with a mat of partially decomposed forest litter 2 inches thick. Typically, the surface layer, when mixed to a depth of 7 inches, is yellowish brown silt loam. The subsurface layer is yellowish brown silt loam 15 inches thick. The upper 16 inches of the subsoil is pale brown and dark yellowish brown very gravelly loam. The lower 22 inches is light olive brown very gravelly light clay loam.

Permeability is moderately slow, and available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for woodland.

Forest management

The Mission Variant soil is suited to Douglas-fir, western larch, western white pine, grand fir, and lodgepole pine. The site index is 65 for Douglas-fir, 70 for western larch, 60 for western white pine, 50 for grand fir, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 120 cubic feet or 625 board feet for western white pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Glaciercreek soil is suited to Douglas-fir, western larch, western white pine, grand fir, and lodgepole pine. The site index is 60 for Douglas-fir, 65 for western larch, 65 for western white pine, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 90 cubic feet or 320 board feet (Scribner rule) for Douglas-fir, 100 cubic feet or 360 board feet for western larch, 130 cubic feet or 690 board feet for western white pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

The Kraft Variant soil is suited to Douglas-fir, western larch, western white pine, grand fir, and lodgepole pine. The site index is 65 for Douglas-fir, 70 for western larch, 65 for western white pine, 50 for grand fir, and 100 for lodgepole pine. The potential annual production (CMAI) per acre is about 100 cubic feet or 380 board feet (Scribner rule) for Douglas-fir, 115 cubic feet or 425 board feet for western larch, 130 cubic feet or 690 board feet for western white pine, or 120 cubic feet or 425 board feet for lodgepole pine. Potential production is estimated for an even-aged, fully stocked stand of trees.

500--Marsh land

Marsh land consists of very wet soils having a wide range of textures and other properties. The main vegetation is water-tolerant herbaceous plants. Marsh land is used for habitat for water-adapted animals and fowl. Some grazing by domestic animals is possible when the uppermost part of the soils is dried enough to support traffic.

600--Made land

This map unit consists of areas that have been disturbed through manipulation. Most of the natural and original soil characteristics and soil properties have been destroyed. It is not possible to classify such areas as soil series.

USE AND MANAGEMENT OF THE SOILS

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and other collect field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Woodland Management and Productivity

Approximately 30,000 acres of the survey area is forested. Forested sites are high productive. A wide variety of tree species is suited to the different soils within the survey area. Among them are Douglas-fir, lodgepole pine, western larch, ponderosa pine, western hemlock, western redcedar, Engelmann spruce, western white pine, black cottonwood, paper birch, aspen, and white spruce. Douglas-fir, western larch, lodgepole pine, and ponderosa pine are the major species presently making up the forest overstory of the area. The dominant climax forest types (series) are western hemlock, grand fir, and Douglas-fir.

Douglas-fir climax forest sites too dry for western larch are on terraces near Troy and on lower south- and west-facing mountain slopes. Moist Douglas-fir climax forest sites (where western larch may be a forest overstory component) and grand fir climax forest sites are intermixed throughout much of th north and central parts of the survey area.

Western hemlock and western redcedar climax forest sites occur on moist north- and east-facing mountain slopes throughout the survey area and on valley terraces in the central and southern parts of the survey area. Western redcedar and Engelmann spruce climax forest sites are associated with subirrigated soils in the valley.

Table 1 can be used by woodland owners or forest managers in planning the use of soils for wood crops.

In table 1, slight, moderate, and severe indicate the degree of the major soil limitations to be considered in management.

Ratings of the erosion hazard indicate the risk of loss of soil in well managed woodland. The risk is slight if the expected soil loss is small, moderate if measures are needed to control erosion during logging and road construction, and severe if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of equipment limitations reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of slight indicates that use of equipment is not limited to a particular kind of equipment or time of year; moderate indicates a short seasonal limitation or a need for some modification in management or in equipment; and severe indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of slight indicates that the expected mortality is less than 25 percent; moderate, 25 to 50 percent; and severe, more than 50 percent.

Ratings of windthrow hazard consider the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of slight indicates that a few trees may be blown down by normal winds; moderate, that some trees will be blown down during periods of excessive soil wetness and strong winds; and severe, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of plant competition indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of slight indicates little or no competition from other plants; moderate indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; severe indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The potential productivity of merchantable or common trees on a soil is expressed as a site index. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands.

Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

During the soil survey, 18 soil-site index correlation plots were inventoried. On many plots, three different species were measured. At a study site representing a particular kind of soil, a minimum of five trees of each species was measured to give a reliable soil-site index for that species. A total of 240 trees was measured. Sufficient data were not available to accurately assess the productivity of all species on all soils for this soil survey. For a number of species and soils, site-index values were estimated.

Site-index estimates for the various soils and suited tree species are presented in Table 1 and in the map unit descriptions. Average annual yield estimates [mean annual increment (MAI) at the culmination of mean annual increment (CMAI)] are also presented for each soil identified in the map unit descriptions. References used to determine the soil site index for many of the tree species growing on the various soils within the survey area and the site-index base ages are listed below.

1. Site indices for Douglas-fir were determined from curves developed by James E. Brickell, 1968, in U.S. Forest Service Research Paper INT-47, entitled A Method for Constructing Site Index Curves from Measurements of Tree Age and Height - Its Application to Inland Douglas-fir. Site Index base is 50 years.

2. Site indices for grand fir were determined from curves developed by Albert R. Stage, 1959, in U.S. Forest Service Research Note INT-71, entitled Site Index Curves for Grand Fir in the Inland Empire.

3. Site indices for lodgepole pine were determined from curves developed by R. R. Alexander, 1966, in U.S. Forest Service Research Paper RM-24, entitled Site Indexes for Lodgepole Pine with Corrections for Stand Density. Site index base is 100 years.

4. Site indices for ponderosa pine were determined from curves developed by W. H. Meyer, 1938, in USDA Technical Bulletin No. 630, entitled Yield of Even-Aged Stands of Ponderosa Pine. Site index base is 100 years.

5. Site indices for western larch were determined from curves developed by L. J. Cummings, 1937, in U.S. Forest Service Research Note-78, entitled Site Classification Curves for Western Larch. Site index base is 50 years.

6. Site indices for white pine were determined from curves developed by I. I. Haigh, 1932, in USDA Technical Bulletin No. 323, entitled Second-Growth Yield, Stand and Volume Tables for the Western White Pine Type. Site index base is 50 years.

Cubic-foot volume estimates are based on all trees greater than 0.6 inch diameter at breast height (dbh) and include stump and tip, but not the bark of the trees. Board-foot (Scribner Rule) volume estimates are based on trees greater than 5 inches dbh, excluding a 1-foot stump. The yield estimates (MAI CMAI) were derived from unpublished curves of annual yield at culmination of mean annual increment in relation to site index developed by SCS. The

primary reference for these curves was Tables of Yields and Mean Annual Increment of Fully Stocked Stands in Major Forest Types in Region One, USFS, Division of Timber Management, 2410, reprinted August 1963. The yield table for ponderosa pine in this reference was adapted to provide yield estimates for ponderosa pine, western larch, and Douglas-fir. The western white pine yield table was used for western white pine. Yield Tables for Managed Stands of Lodgepole Pine in Colorado and Wyoming, USFS Research Paper RM-26, was used to develop the curves for lodgepole pine. Yield estimates are for fully stocked, even-aged stands composed primarily of a single species.

TABLE 1--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated.)

Map Symbol and Soil Name	Management Concerns					Potential Productivity[1/]
	Erosion Hazard	Equipment Limitation	Seedling Mortality	Windthrow Hazard	Plant Competition	Common Trees and Site Index
5B Antero Variant						
9B Argenta Variant	SLIGHT	MODERATE	MODERATE	MODERATE	MODERATE	Engelmann spruce (-), western larch (-), Douglas-fir (-), western redcedar (-).
40C, 40D, 40E Courville	SLIGHT: 4-30% slopes MODERATE: 30-35% slopes	SLIGHT 4-30% slopes MODERATE: 30-35% slopes	SLIGHT	MODERATE	MODERATE: 40C, 40D SEVERE: 40E	40C, 40D--Douglas-fir (65), western larch (70), lodgepole pine (100), ponderosa pine (110), western hemlock (-). 40E--Douglas-fir (60), western larch (65), lodgepole pine (90), ponderosa pine (105).
140F Courville	MODERATE	MODERATE	SLIGHT	MODERATE	MODERATE	Douglas-fir (65), lodgepole pine (100), western larch (70), ponderosa pine (110).
Mitten	MODERATE	MODERATE	SLIGHT	MODERATE	MODERATE	Douglas-fir (60), lodgepole pine (85), western larch (60), ponderosa pine (95).
340D Courville	SLIGHT	SLIGHT	SLIGHT	MODERATE	MODERATE	Douglas-fir (65), grand fir (-), western larch (70), western white pine (65), lodgepole pine (100).
164E Entente Variant	MODERATE: 15-30% slopes SEVERE: 30-35% slopes	MODERATE: 15-30% slopes SEVERE 30-35% slopes	SLIGHT	MODERATE	MODERATE	Douglas-fir (65), western larch (70), grand fir (-), western white pine (-), lodgepole pine (-), ponderoda pine (115).
Selon Variant	MODERATE: 15-30% slopes SEVERE: 30-35% slopes	MODERATE: 15-30% slopes SEVERE: 30-35% slopes	SLIGHT	MODERATE	MODERATE	Douglas-fir (60), western larch (75), grand fir (50), western white pine (60), lodgepole pine (100), ponderosa pine (115).

[1/] A (-) indicates insufficient data available to make an estimate.

TABLE 1--WOODLAND MANAGEMENT AND PRODUCTIVITY

Map Symbol and Soil Name	Management Concerns					Potential Productivity[1/]
	Erosion Hazard	Equipment Limitation	Seedling Mortality	Windthrow Hazard	Plant Competition	Common Trees and Site Index
10B, 10C, 10D						
Glaciercreek	SLIGHT	SLIGHT	MODERATE	MODERATE	MODERATE	10B--Douglas-fir (60), western larch (65), ponderosa pine (110), western white pine (65). 10C, 10D--Douglas-fir (60), ponderosa pine (110), western larch (65), lodgepole pine (100), western white pine (65).
210D, 210E						
Glaciercreek	SLIGHT: 6-30% slopes MODERATE: 30-35% slopes	SLIGHT: 6-30% slopes MODERATE: 30-35% slopes	MODERATE	MODERATE	MODERATE	Douglas-fir (60), lodgepole pine (100), western larch (65), ponderosa pine (110), grand fir (-), western white pine (65).
Courville	SLIGHT: 6-30% slopes MODERATE: 30-35% slopes	SLIGHT: 6-30% slopes MODERATE: 30-35% slopes	SLIGHT	MODERATE	MODERATE	Douglas-fir (65), lodgepole pine (100), western larch (70), ponderosa pine (110), grand fir (-), western white pine (65).
163F						
Glaciercreek	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	Douglas-fir (55), lodgepole pine (90), western larch (60), ponderosa pine (95).
Yellowbay	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	Douglas-fir (55), lodgepole pine (90), western larch (60), ponderosa pine (90).
30B, 30E, 165F						
Halfmoon	SLIGHT: 0-15% slopes MODERATE: 15-30% slopes SEVERE: 30-60% slopes	SLIGHT: 0-15% slopes MODERATE: 15-30% slopes SEVERE: 30-60% slopes	SLIGHT: 30E MODERATE: 30B, 165F	SLIGHT: 30B, 165F MODERATE: 30E	MODERATE	30B--Douglas-fir (55), western larch (60), ponderosa pine (85), western white pine (-), grand fir (-). 30E--Douglas-fir (60), western larch (60), ponderosa pine (100), western white pine (55), lodgepole pine (95), grand fir (-). 165F--ponderosa pine (80), western larch (55), Douglas-fir (50).
131E						
Kraft Variant	MODERATE	MODERATE	MODERATE	SLIGHT	MODERATE	Douglas-fir (60), western larch (60), ponderosa pine (95), grand fir (-), lodgepole pine (85).

TABLE 1--WOODLAND MANAGEMENT AND PRODUCTIVITY

Map Symbol and Soil Name	Management Concerns: Erosion Hazard	Equipment Limitation	Seedling Mortality	Windthrow Hazard	Plant Competition	Potential Productivity[1]/: Common Trees and Site Index
131E (continued) Mission Variant	MODERATE	MODERATE	SLIGHT	MODERATE	MODERATE	Douglas-fir (60), western larch (65), ponderosa pine (105), grand fir (-), lodgepole pine (95).
600 Made land						
500 Marsh land						
20B, 162F McCaffery Variant	SLIGHT: 0-6% slopes SEVERE: 30-60% slopes	SLIGHT: 0-6% slopes SEVERE 30-60% slopes	MODERATE	SLIGHT: 20B MODERATE: 162F	MODERATE	20B--Douglas-fir (55), ponderosa pine (95), western larch (60), western white pine (-). 162F--Douglas-fir (55), western larch (60), grand fir (-), western white pine (-), ponderosa pine (100).
Selon Variant	SLIGHT: 0-6% slopes SEVERE: 30-60% slopes	SLIGHT: 0-6% slopes SEVERE: 30-60% slopes	SLIGHT: 162F MODERATE: 20B	SLIGHT: 20B MODERATE 162F	MODERATE	20B--Douglas-fir (60), ponderosa pine (105), western larch (70), western white pine (-). 162F--Douglas-fir (60), western larch (70), grand fir (45), western white pine (55), ponderosa pine (110).
31B, 31D Mission Variant	SLIGHT	SLIGHT	SLIGHT	MODERATE	MODERATE	Douglas-fir (65), grand fir (50), western larch (70), ponderosa pine (115), western white pine (60).
131C Mission Variant	SLIGHT	SLIGHT	SLIGHT	MODERATE	SLIGHT	Douglas-fir (65), western larch (70), western white pine (60), grand fir (50), ponderosa pine (115), lodgepole pine (100).
431B Mission Variant	SLIGHT	SLIGHT	SLIGHT	MODERATE	SLIGHT	Douglas-fir (65), western larch (70), western white pine (60), grand fir (50), lodgepole pine (100).
Glaciercreek	SLIGHT	SLIGHT	MODERATE	MODERATE	MODERATE	Douglas-fir (60), western larch (65), western white pine (65), grand fir (-), ponderosa pine (110), lodgepole pine (100).

TABLE 1--WOODLAND MANAGEMENT AND PRODUCTIVITY

Map Symbol and Soil Name	Management Concerns					Potential Productivity[1/]
	Erosion Hazard	Equipment Limitation	Seedling Mortality	Windthrow Hazard	Plant Comptetition	Common Trees and Site Index
431B (continued) Kraft Variant	SLIGHT	SLIGHT	SLIGHT	MODERATE	SLIGHT	Douglas-fir (65), western larch (70), western white pine (65), grand fir (50), ponderosa pine (110), lodgepole pine (100).
231B Mission Variant	SLIGHT	SLIGHT	SLIGHT	MODERATE	SLIGHT	Western larch (75), Engelmann spruce (-), grand fir (50), Douglas-fir (70), western white pine (65), lodgepole pine (100).
Somers Variant	SLIGHT	SEVERE	SLIGHT	SEVERE	SLIGHT	
150E, 150F Mitten	SLIGHT: 10-30% slopes MODERATE: 30-60% slopes	SLIGHT: 10-30% slopes MODERATE: 30-60% slopes	MODERATE	SLIGHT	MODERATE	Douglas-fir (60), western larch (60), grand fir (-), western white pine (-), ponderosa pine (95), lodgepole pine (85).
Courville	SLIGHT: 10-30% slopes MODERATE: 30-60% slopes	SLIGHT: 10-30% slopes MODERATE: 30-60% slopes	MODERATE	SLIGHT	MODERATE	Douglas-fir (60), western larch (65), grand fir (-), western white pine (-), ponderosa pine (105), lodgepole pine (90).
350G Mitten	MODERATE: 45-60% slopes SEVERE: 60-75% slopes	MODERATE: 45-60% slopes SEVERE: 60-75% slopes	MODERATE	SLIGHT	MODERATE	Douglas-fir (60), western larch (60), grand fir (-), lodgepole pine (85), ponderosa pine (95).
Entente Variant	SEVERE	SEVERE	SLIGHT	MODERATE	MODERATE	Douglas-fir (60), western larch (65), grand fir (-), lodgepole pine (-), ponderosa pine (105).
350C Mitten	SLIGHT	SLIGHT	SLIGHT	MODERATE	MODERATE	Douglas-fir (65), western larch (70), grand fir (50), western white pine (65), Engelmann spruce (-), lodgepole pine (100).

TABLE 1--WOODLAND MANAGEMENT AND PRODUCTIVITY

Map Symbol and Soil Name	Management Concerns: Erosion Hazard	Equipment Limitation	Seedling Mortality	Windthrow Hazard	Plant Competition	Potential Productivity[1]: Common Trees and Site Index
350C (continued) Mission Variant	SLIGHT	SLIGHT	SLIGHT	MODERATE	SLIGHT	Douglas-fir (70), western larch (75), grand fir (50),western white pine (65), Engelmann spruce (-), lodgepole pine (100).
250F Mitten	MODERATE	MODERATE	MODERATE	SLIGHT	MODERATE	Douglas-fir (60), grand fir (-), ponderosa pine (95), western larch (60), lodgepole pine (85).
Sharrott Variant	MODERATE	SEVERE	SEVERE	MODERATE	SEVERE	Douglas-fir (40), ponderosa pine (65).
300 Pits, gravel						
100 Riverwash						
400 Rock outcrop						
200 Rubble land						
331B, 331C Savenac Variant	SLIGHT	SLIGHT	SLIGHT	MODERATE	MODERATE	Western larch (70), Douglas-fir (65), grand fir (50), western white pine (60), ponderosa pine (115), lodgepole pine (100).
Mission Variant	SLIGHT	SLIGHT	SLIGHT	MODERATE	MODERATE	Western larch (70), Douglas-fir (65), grand fir (45), western white pine (60), ponderosa pine (115), lodgepole pine (100).
21B, 21C, 21E Selon Variant	SLIGHT: 0-15% slopes MODERATE: 15-30% slopes SEVERE: 30-35% slopes	SLIGHT: 0-15% slopes MODERATE: 15-30% slopes SEVERE: 30-35% slopes	SLIGHT: 21B, 21E MODERATE: 21C	SLIGHT: 21C MODERATE: 21B, 21E	MODERATE	21B, 21E--Douglas-fir (65), western larch (75), western white pine (60), grand fir (50), ponderosa pine (115). 21C--Douglas-fir (60), ponderosa pine (105), western larch (70), western white pine (-), grand fir (-).
6B Selon Variant	SLIGHT	SLIGHT	MODERATE	SLIGHT	MODERATE	Ponderosa pine (105), Douglas-fir (60), western larch (70).

TABLE 1--WOODLAND MANAGEMENT AND PRODUCTIVITY

Map Symbol and Soil Name	Management Concerns					Potential Productivity[1/]
	Erosion Hazard	Equipment Limitation	Seedling Mortality	Windthrow Hazard	Plant Competition	Common Trees and Site Index
6B (continued) Yellowbay	SLIGHT	SLIGHT	SEVERE	SLIGHT	SEVERE	Ponderosa pine (100), Douglas-fir (60), western larch (60).
152G Sharrott Variant	MODERATE: 45-60% slopes SEVERE: 60-75% slopes	SEVERE	SEVERE	MODERATE	SEVERE	Douglas-fir (40), ponderosa pine (65).
Mitten	MODERATE: 45-60% slopes SEVERE: 60-75% slopes	MODERATE: 45-60% slopes SEVERE: 60-75% slopes	MODERATE	SLIGHT	MODERATE	Douglas-fir (55), lodgepole pine (80), western larch (55), ponderosa pine (90).
Rock outcrop						
252G Sharrott Variant	MODERATE: 45-60% slopes SEVERE: 60-75% slopes	SEVERE	SEVERE	SLIGHT	SEVERE	Douglas-fir (35), ponderosa pine (60).
Rock outcrop						
Tevis	MODERATE: 45-60% slopes SEVERE: 60-75%	MODERATE: 45-60% slopes SEVERE: 60-75%	SEVERE	SLIGHT	SEVERE	Douglas-fir (50), ponderosa pine (80), lodgepole pine (-).
2A Somers Variant						Engelmann spruce (-), western redcedar (-).
3A Stryker Variant						

TABLE 1--WOODLAND MANAGEMENT AND PRODUCTIVITY

Map Symbol and Soil Name	Management Concerns					Potential Productivity[1/]
	Erosion Hazard	Equipment Limitation	Seedling Mortality	Windthrow Hazard	Plant Competition	Common Trees and Site Index
161F						
Tevis	MODERATE	MODERATE	SEVERE	SLIGHT	SEVERE	Ponderosa pine (90), western larch (55), lodgepole pine (-), Douglas-fir (55).
Yellowbay	MODERATE	MODERATE	SEVERE	SLIGHT	SEVERE	Ponderosa pine (85), western larch (50), lodgepole pine (-), Douglas-fir (50).
1A						
Udifluvents						
7B						
Waits Variant	SLIGHT	SLIGHT	MODERATE	SLIGHT	SEVERE	Douglas-fir (60), ponderosa pine (85), western larch (55).
4B						
Yellowbay	SLIGHT	SLIGHT	SEVERE	SLIGHT	SEVERE	Ponderosa pine (85), Douglas-fir (60).
11B						
Yellowbay	SLIGHT	SLIGHT	SEVERE	SLIGHT	SEVERE	Douglas-fir (60), grand fir (-), ponderosa pine (100), western larch (60), western white pine (-).

Engineering

This section provides information for planning land uses related to urban development. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, and Construction materials. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land-use planning, for evaluating land-use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet, and, because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site-specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals and mineralogy of the sand and silt fractions. Estimates were made for erodibility, permeability, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, and earthfill; and (7) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 2 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibley increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

TABLE 2--BUILDING SITE DEVELOPMENT

(Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated.)

Map Symbol and Soil Name	Shallow Excavations	Dwellings Without Basements	Dwellings With Basements	Small Commercial Buildings	Local Streets and Roads
5B Antero Variant	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Frost action, seasonal high water table at 5 to 24 inches
9B Argenta Variant	SEVERE: Cutbanks cave, seasonal high water table at 36 to 60 inches	SEVERE: Subject to flooding	SEVERE: Subject to flooding	SEVERE: Subject to flooding	SEVERE: Frost action, subject to flooding
40C, 40D, 40E Courville	SLIGHT: 4 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 4 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 4 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	MODERATE: 4 to 8% slopes SEVERE: 8+% slopes	SLIGHT: 4 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes
140F Courville	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
Mitten	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
340D Courville	MODERATE: 10 to 15% slopes, large stones SEVERE: 15 to 20% slopes	MODERATE: 10 to 15% slopes, large stones SEVERE: 15 to 20% slopes	MODERATE: 10 to 15% slopes, large stones SEVERE: 15 to 20% slopes	SEVERE: Steep slopes	MODERATE: 10 to 15% slopes, large stones SEVERE: 15+% slopes
164E Entente Variant	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
Selon Variant	SEVERE: Steep slopes, cutbanks cave	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
10B, 10C, 10D Glaciercreek	SEVERE: Cutbanks cave	SLIGHT: 0 to 8% slopes MODERATE: 8 to 15% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 15% slopes	SLIGHT: 0 to 4% slopes MODERATE: 4 to 8% slopes SEVERE: 8+% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 15% slopes
210D, 210E Glaciercreek	SEVERE: Cutbanks cave, slopes greater than 15%	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	MODERATE: 6 to 8% slopes SEVERE: 8+% slopes	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes

TABLE 2--BUILDING SITE DEVELOPMENT

Map Symbol and Soil Name	Shallow Excavations	Dwellings Without Basements	Dwellings With Basements	Small Commercial Buildings	Local Streets and Roads
210D, 210E (continued) Courville	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	MODERATE: 6 to 8% SEVERE: 8+% slopes	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes
163F Glaciercreek	SEVERE: Cutbanks cave, steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
Yellowbay	SEVERE: Cutbanks cave, Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
30B, 30E, 165F Halfmoon	SEVERE: Cutbanks cave, slopes greater than 15%	SLIGHT: 0 to 6% slopes MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 0 to 6% slopes MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 0 to 4% slopes MODERATE: 4 to 6% slopes SEVERE: 10 to 30% slopes	MODERATE: 0 to 15% slopes--frost action, low strength SEVERE: 15+% slopes
131E Kraft Variant	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE 10 to 15% slopes SEVERE: 15+% slopes	SEVERE: Steep slopes	MODERATE: 10 to 15% slopes, frost action SEVERE: 15+% slopes
Mission Variant	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	SEVERE: Steep slopes	MODERATE: 10 to 15% slopes, frost action, low strength
600 Made land	Properties are too variable to rate.				
500 Marsh land	Properties are too variable to rate.				
20B, 162F McCaffery Variant	SEVERE: Cutbanks cave, slopes greater than 15%	SLIGHT: 0 to 6% slopes SEVERE: 30 to 60% slopes	SLIGHT: 0 to 6% slopes SEVERE: 30 to 60% slopes	SLIGHT: 0 to 4% slopes MODERATE: 4 to 6% slopes SEVERE: 30 to 60% slopes	SLIGHT: 0 to 6% slopes SEVERE: 30 to 60% slopes
Selon Variant	SEVERE: Cutbanks cave, slopes greater than 15%	SLIGHT: 0 to 6% slopes SEVERE: 30 to 60% slopes	SLIGHT: 0 to 6% slopes SEVERE: 30 to 60% slopes	SLIGHT: 0 to 4% slopes MODERATE: 4 to 6% slopes SEVERE: 30 to 60% slopes	SLIGHT to MODERATE: 0 to 6% slopes--low strength SEVERE: 30 to 60% slopes

TABLE 2--BUILDING SITE DEVELOPMENT

Map Symbol and Soil Name	Shallow Excavations	Dwellings Without Basements	Dwellings With Basements	Small Commercial Buildings	Local Streets and Roads
31B, 31D					
Mission Variant	SLIGHT: 0 to 4% slopes MODERATE: 8 to 15% slopes	SLIGHT: 0 to 4% slopes MODERATE: 8 to 15% slopes	SLIGHT: 0 to 4% slopes MODERATE: 8 to 15% slopes	SLIGHT: 0 to 4% slopes SEVERE: 8 to 15% slopes	MODERATE: 0 to 15% slopes frost action, low strength
131C					
Mission Variant	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 4% slopes MODERATE: 4 to 8% slopes SEVERE: 8 to 10% slopes	MODERATE: Frost action, low strength
431B					
Mission Variant	SLIGHT	SLIGHT	SLIGHT	SLIGHT	MODERATE: Frost action, low strength
Glaciercreek	SEVERE: Cutbanks cave	SLIGHT	SLIGHT	SLIGHT	SLIGHT
Kraft Variant	SLIGHT	SLIGHT	SLIGHT	SLIGHT	MODERATE: Frost action
231B					
Mission Variant	SLIGHT	SLIGHT	SLIGHT	SLIGHT: 0 to 4% slopes MODERATE: 4 to 6% slopes	MODERATE: Frost action, low strength
Somers Variant	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Frost action, seasonal high water table at 10 to 30 inches
150E, 150F					
Mitten	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	SEVERE: Steep slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes
Courville	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	SEVERE: Steep slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes
350G					
Mitten	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
Entente Variant	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
350C					
Mitten	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 4% slopes MODERATE: 4 to 8% slopes SEVERE: 8+% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes

TABLE 2--BUILDING SITE DEVELOPMENT

Map Symbol and Soil Name	Shallow Excavations	Dwellings Without Basements	Dwellings With Basements	Small Commercial Buildings	Local Streets and Roads
350C (continued) Mission Variant	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 4% slopes MODERATE: 4 to 8% slopes SEVERE: 8+% slopes	MODERATE: Frost action, low strength
250F					
Mitten	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steel slopes	SEVERE: Steep slopes
Sharrott Variant	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes
300 Pits, gravel	Properties are too variable to rate.				
100 Riverwash	Properties are too variable to rate.				
400 Rock outcrop	Properties are too variable to rate.				
200 Rubble land	Properties are too variable to rate.				
331B, 331C					
Savenac Variant	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 0 to 4% slopes MODERATE: 4 to 8% slopes SEVERE: 8+% slopes	MODERATE to SEVERE: Low strength, frost action
Mission Variant	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 0 to 4% slopes MODERATE: 4 to 8% slopes SEVERE: 8+% slopes	MODERATE: Low strength, frost action
21B, 21C, 21E					
Selon Variant	SEVERE: Cutbanks cave, slopes greater than 15%	SLIGHT: 0 to 8% slopes SEVERE: 15 to 35% slopes	SLIGHT: 0 to 8% slopes SEVERE: 15 to 35% slopes	SLIGHT: 0 to 4% slopes MODERATE: 4 to 8% slopes SEVERE: 15 to 35% slopes	SLIGHT to MODERATE: 0 to 8% slopes, low strength SEVERE: 15 to 35% slopes
6B					
Selon Variant	SEVERE: Cutbanks cave	SLIGHT	SLIGHT	SLIGHT	SLIGHT to MODERATE: Low strength
Yellowbay	SEVERE: Cutbanks cave	SLIGHT	SLIGHT	SLIGHT	SLIGHT

TABLE 2--BUILDING SITE DEVELOPMENT

Map Symbol and Soil Name	Shallow Excavations	Dwellings Without Basements	Dwellings With Basements	Small Commercial Buildings	Local Streets and Roads
152G					
Sharrott Variant	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes
Mitten	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
Rock Outcrop	Properties are too variable to rate.				
252G					
Sharrott Variant	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes
Rock outcrop	Properties are too variable to rate.				
Tevis	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
2A					
Somers Variant	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Frost action, seasonal high water table at 10 to 30 inches
3A					
Stryker Variant	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Frost action, low strength, seasonal high water table at 8 to 20 inches
161F					
Tevis	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
Yellowbay	SEVERE: Cutbanks cave, steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes
1A					
Udifluvents	SEVERE: Cutbanks cave, occasional flooding	SEVERE: Subject to flooding	SEVERE: Subject to flooding	SEVERE: Subject to flooding	SEVERE: Subject to flooding
7B					
Waits Variant	SLIGHT	SLIGHT	SLIGHT	SLIGHT	MODERATE: Frost action, low strength
4B					
Yellowbay	SEVERE: Cutbanks cave	SLIGHT	SLIGHT	SLIGHT	SLIGHT
11B					
Yellowbay	SEVERE: Cutbanks cave	SLIGHT	SLIGHT	SLIGHT	SLIGHT

Sanitary Facilities

Table 3 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered slight if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; moderate if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and severe if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 3 also shows the suitability of the soils for use as daily cover for landfills. A rating of good indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; fair indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and poor indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented plan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 3 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon cause a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in the soil. There are two types of landfill--trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 3 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench-type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area-type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

TABLE 3--SANITARY FACILITIES

(Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated.)

Map Symbol and Soil Name	Septic Tank Absorption Fields	Sewage Lagoon Areas	Trench Sanitary Landfill	Area Sanitary Landfill	Daily Cover for Landfill
5B Antero Variant	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	POOR: Seasonal high water table
9B Argenta Variant	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table, seepage	SEVERE: Seepage	POOR: Seepage, small stones
40C, 40D, 40E Courville	SLIGHT: 4 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	MODERATE: 4 to 7% slopes, moderate permeability SEVERE: 7+% slopes	SLIGHT: 4 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 4 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	POOR: Small stones, slopes greater than 15%
140F Courville	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	POOR: Small stones, steep slopes
Mitten	SEVERE: Steep slopes	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes seepage	POOR: Small stones, steep slopes
340D Courville	MODERATE: 10 to 15% slopes SEVERE: 15 to 20% slopes	SEVERE: Steep slopes, large stones	SEVERE: Large stones, steep slopes 15 to 20% part	MODERATE: 10 to 15% SEVERE: 15 to 20% slopes	POOR: Small stones, slopes greater than 15%
164E Entente Variant	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	POOR: Steep slopes
Selon Variant	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes seepage	SEVERE: Steep slopes seepage	POOR: Steep slopes
10B, 10C, 10D Glaciercreek	SEVERE: Poor filter	SEVERE: Seepage	SEVERE: Seepage	SEVERE: Seepage	POOR: Small stones, seepage, thin layer
210D, 210E Glaciercreek	SEVERE: 6 to 15% slopes--poor filter SEVERE: 15 to 35% slopes--poor filter, steep slopes	SEVERE: Seepage, steep slope	SEVERE: Seepage, 15+% slopes	SEVERE: Seepage, 15+% slopes	POOR: Small stones, seepage, thin layer, slopes greater than 15%

Map Symbol and Soil Name	Septic Tank Absorption Fields	Sewage Lagoon Areas	Trench Sanitary Landfill	Area Sanitary Landfill	Daily Cover for Landfill
210D, 210E (continued) Courville	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	SEVERE: Steep slopes	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	SLIGHT: 6 to 8% slopes MODERATE: 8 to 15% slopes SEVERE: 15+% slopes	POOR: Small stones, slopes greater than 15%
163F Glaciercreek	SEVERE: Steep slopes, poor filter	SEVERE: Seepage, steep slopes	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	POOR: Small stones, seepage, thin layer, steep slopes
Yellowbay	SEVERE: Steep slopes, poor filter	SEVERE: Seepage, steep slopes	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes seepage	POOR: Small stones, seepage, thin layer, steep slopes
30B, 30E, 165F Halfmoon	SEVERE: 0 to 15% slopes--moderately slow permeability SEVERE: 15+% slopes--steep slopes, moderately slow permeability	SEVERE: Seepage	SEVERE: Seepage, slopes greater than 15%	SEVERE: Seepage, slopes greater than 15%	FAIR: 0 to 15% slopes, thin layer POOR: 15+% slopes
131E Kraft Variant	SEVERE: Moderately slow permeability, steep slopes	SEVERE: Steep slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	POOR: Small stones, thin layer, steep slopes
Mission Variant	SEVERE: Moderately slow permeability, steep slopes	SEVERE: Steep slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	POOR: Small stones, slopes greater than 15%
600 Made land	Properties are too variable to rate				
500 Marsh land	Properties are too variable to rate				
20B, 162F McCaffery Variant	SEVERE: 0 to 6% slopes--poor filter SEVERE: 30 to 60% slopes--poor filter, steep slopes	SEVERE: Seepage	SEVERE: Seepage, 30 to 60% slopes	SEVERE: Seepage, 30 to 60% slopes	POOR: Seepage, thin layer, slopes greater than 15%

TABLE 3--SANITARY FACILITIES

Map Symbol and Soil Name	Septic Tank Absorption Fields	Sewage Lagoon Areas	Trench Sanitary Landfill	Area Sanitary Landfill	Daily Cover for Landfill
20B, 162F (continued)					
Selon Variant	MODERATE: 0 to 6% slopes--moderate permeability SEVERE: 30 to 60% slopes--steep slopes	SEVERE: Seepage	SEVERE: Seepage, 30 to 60% slopes	SEVERE: Seepage, 30 to 60% slopes	GOOD: 0 to 6% slopes POOR: 30 to 60% slopes
31B, 31D					
Mission Variant	SEVERE: Moderately slow permeability	SLIGHT: 0 to 2% slopes MODERATE: 2 to 4% slopes SEVERE: 8 to 15% slopes	SLIGHT: 0 to 4% slopes MODERATE: 8 to 15% slopes	SLIGHT: 0 to 4% slopes MODERATE: 8 to 15% slopes	GOOD: 0 to 4% slopes FAIR: 8 to 15% slopes
131C					
Mission Variant	SEVERE: Moderately slow permeability	MODERATE: 3 to 7% slopes SEVERE: 7 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	POOR: Thin layer, small stones
431B					
Mission Variant	SEVERE: Moderately slow permeability	SLIGHT: 0 to 2% slopes MODERATE: 2 to 4% slopes	SLIGHT	SLIGHT	GOOD
Glaciercreek	SEVERE: Poor filter	SEVERE: Seepage	SEVERE: Seepage	SEVERE: Seepage	POOR: Small stones, seepage, thin layer
Kraft Variant	SEVERE: Moderately slow permeability	SLIGHT: 0 to 2% slopes MODERATE: 2 to 4% slopes	SLIGHT	SLIGHT	POOR: Small stones, thin layer
231B					
Mission Variant	SEVERE: Moderately slow permeability	SLIGHT: 0 to 2% slopes MODERATE: 2 to 6% slopes	SLIGHT	SLIGHT	GOOD
Somers Variant	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	FAIR to POOR: Seasonal high water table

TABLE 3--SANITARY FACILITIES

Map Symbol and Soil Name	Septic Tank Absorption Fields	Sewage Lagoon Areas	Trench Sanitary Landfill	Area Sanitary Landfill	Daily Cover for Landfill
150E, 150F					
Mitten	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	SEVERE: Steep slopes, seepage	SEVERE: Seepage, slopes greater than 15%	SEVERE: Seepage, slopes greater than 15%	POOR: Small stones, steep slopes
Courville	MODERATE: 10 to 15% slopes, moderate permeability SEVERE: 15+% slopes	SEVERE: Steep slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	MODERATE: 10 to 15% slopes SEVERE: 15+% slopes	POOR: Small stones, steep slopes
350G					
Mitten	SEVERE: Steep slopes	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	POOR: Small stones, steep slopes
Entente Variant	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	SEVERE: Steep slopes	POOR: Steep slopes
350C					
Mitten	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SEVERE: Seepage, slopes greater than 7%	SEVERE: Seepage	SEVERE: Seepage	POOR: Small stones
Mission Variant	SEVERE: Moderately slow permeability	MODERATE: 3 to 7% slopes SEVERE: 7 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 3 to 8% slopes MODERATE: 8 to 10% slopes	GOOD: 3 to 8% slopes FAIR: 8 to 10% slopes
250F					
Mitten	SEVERE: Steep slopes	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	POOR: Small stones, steep slopes
Sharrott Variant	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	POOR: Shallow depth to bedrock, steep slopes
300					
Pits, gravel	Properties are too variable to rate.				
100					
Riverwash	Properties are too variable to rate.				
400					
Rock outcrop	Properties are too variable to rate.				
200					
Rubble land	Properties are too variable to rate.				

TABLE 3--SANITARY FACILITIES

Map Symbol and Soil Name	Septic Tank Absorption Fields	Sewage Lagoon Areas	Trench Sanitary Landfill	Area Sanitary Landfill	Daily Cover for Landfill
331B, 331C					
Savenac Variant	SEVERE: Slow permeability	SLIGHT: 0 to 2% slopes MODERATE: 2 to 7% slopes SEVERE: 7 to 10% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	GOOD: 0 to 8% slopes FAIR: 8 to 10% slopes
Mission Variant	SEVERE: Moderately slow permeability	SLIGHT: 0 to 2% slopes MODERATE: 2 to 7% slopes SEVERE: 7 to 10% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	SLIGHT: 0 to 8% slopes MODERATE: 8 to 10% slopes	GOOD: 0 to 8% slopes FAIR: 8 to 10% slopes
21B, 21C, 21E					
Selon Variant	MODERATE: 0 to 8% slopes--moderate permeability SEVERE: 15 to 35% slopes--steep slopes	SEVERE: Seepage	SEVERE: Seepage, slopes greater than 15%	SEVERE: Seepage, slopes greater than 15%	FAIR: 0 to 8% slopes--thin layer POOR: 15+% slopes
6B					
Selon Variant	MODERATE: Moderate permeability	SEVERE: Seepage	SEVERE: Seepage	SEVERE: Seepage	FAIR: 0 to 4% slopes--thin layer
Yellowbay	SEVERE: Poor filter	SEVERE: Seepage	SEVERE: Seepage	SEVERE: Seepage	POOR: Small stones, thin layer, seepage
152G					
Sharrott Variant	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	POOR: Shallow depth to bedrock, steep slopes
Mitten	SEVERE: Steep slopes	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes seepage	POOR: Small stones, steep slopes
Rock outcrop	Properties are too variable to rate.				
252G					
Sharrott Variant	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	SEVERE: Shallow depth to bedrock, steep slopes	POOR: Shallow depth to bedrock, steep slopes
Rock outcrop	Properties are too variable to rate.				
Tevis	SEVERE: Steep slopes	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	POOR: Small stones, steep slopes

TABLE 3--SANITARY FACILITIES

Map Symbol and Soil Name	Septic Tank Absorption Fields	Sewage Lagoon Areas	Trench Sanitary Landfill	Area Sanitary Landfill	Daily Cover for Landfill
2A Somers Variant	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	POOR to FAIR: Seasonal high water table
3A Stryker Variant	SEVERE: Seasonal high water table, moderately slow permeability	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	SEVERE: Seasonal high water table	POOR: Seasonal high water table
161F Tevis	SEVERE: Steep slopes	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	POOR: Small stones, steep slopes
Yellowbay	SEVERE: Steep slopes, poor filter	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	SEVERE: Steep slopes, seepage	POOR: Small stones, thin layer, seepage, steep slopes
1A Udifluvents	Properties are too variable to rate.				
7B Waits Variant	SLIGHT	SEVERE: Seepage	SEVERE: Seepage	SEVERE: Seepage	GOOD
4B Yellowbay Variant	SEVERE: Poor filter	SEVERE: Seepage	SEVERE: Seepage	SEVERE: Seepage	POOR: Small stones, thin layer
11B Yellowbay	SEVERE: Poor filter	SEVERE: Seepage	SEVERE: Seepage	SEVERE: Seepage	POOR: Small stones, thin layer, seepage

Construction Materials

Table 4 gives information about the soils as a source of roadfill, sand, and gravel. The soils are rated good, fair, or poor as a source of roadfill. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated good contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated fair are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated poor have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 4, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

TABLE 4--CONSTRUCTION MATERIALS

(Some of the terms used in this table to describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "poor," and "unsuited." Absence of an entry means soil was not rated.)

Map Symbol and Soil Name	Roadfill	Sand (Probable or Improbable Source)	Gravel (Probable or Improbable Source)
5B			
Antero Variant	FAIR to POOR: Seasonal high water table at 5 to 24 inches	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
9B			
Argenta Variant	GOOD	IMPROBABLE: Small stones, excess fines	PROBABLE: Below 42 inches
40C, 40D, 40E			
Courville	GOOD: 4 to 15% slopes FAIR: 15 to 25% slopes POOR: 25+% slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
140F			
Courville	POOR: Steep slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
Mitten	POOR: Steep slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
340D			
Courville	FAIR: Large stones, steep slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
164E			
Entente Variant	FAIR: Low strength, 15 to 25% slopes POOR: 25+% slopes	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
Selon Variant	FAIR: 15 to 25% slopes POOR: 25+% slopes	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
10B, 10C, 10D			
Glaciercreek	GOOD	IMPROBABLE: Small stones	PROBABLE: Below 30 inches
210D, 210E			
Glaciercreek	GOOD: 6 to 15% slopes FAIR: 15 to 25% slopes POOR: 25+% slopes	IMPROBABLE: Small stones	PROBABLE; Below 30 inches
Courville	GOOD: 6 to 15% slopes FAIR: 15 to 25% slopes POOR: 25+% slopes	IMPROBABLE: Small stones	IMPROBABLE: Excess fines

TABLE 4--CONSTRUCTION MATERIALS

Map Symbol and Soil Name	Roadfill	Sand (Probable or Improbable Source)	Gravel (Probable or Improbable Source)
163F			
Glaciercreek	POOR: Steep slopes	IMPROBABLE: Small stones	PROBABLE: Below 30 inches
Yellowbay	POOR: Steep slopes	IMPROBABLE: Small stones	PROBABLE: Below 26 inches
30B, 30E, 165F			
Halfmoon	GOOD: 0 to 15% slopes (for material below 42 inches) FAIR: 15 to 25% slopes (for material below 42 inches) POOR: 25+% slopes	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
131E			
Kraft Variant	FAIR: 10 to 25% slopes, low strength POOR: 25+% slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
Mission Variant	FAIR: 10 to 25% slopes, low strength POOR: 25+% slopes	IMPROBABLE: Excess fines, small stones	IMPROBABLE: Excess fines
600			
Made land	Properties are too variable to rate.		
500			
Marsh land	Properties are too variable to rate.		
20B, 162F			
McCaffery Variant	GOOD: 0 to 6% slopes POOR: 30 to 60% slopes	PROBABLE: Below 42 inches	IMPROBABLE: Too sandy, excess fines
Selon Variant	FAIR to GOOD: 0 to 6% slopes--low strength; GOOD below 52 inches POOR: 30 to 60% slopes	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
31B, 31D			
Mission Variant	FAIR: Low strength	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
131C			
Mission Variant	FAIR to GOOD: (Below 36 inches) low strength	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
431B			
Mission Variant	FAIR: Low strength	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
Glaciercreek	GOOD	IMPROBABLE: Small stones	PROBABLE: Below 30 inches
Kraft Variant	FAIR to GOOD: (Below 22 inches) low strength	IMPROBABLE: Excess fines, small stones	IMPROBABLE: Excess fines

TABLE 4--CONSTRUCTION MATERIALS

Map Symbol and Soil Name	Roadfill	Sand (Probable or Improbable Source)	Gravel (Probable or Improbable Source)
231B			
Mission Variant	FAIR: Low strength	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
Somers Variant	FAIR: Low strength, seasonal high water table at 10 to 30 inches	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
150E, 150F			
Mitten	GOOD: 10 to 15% slopes FAIR: 15 to 25% slopes POOR: 25+% slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
Courville	GOOD: 10 to 15% slopes FAIR: 15 to 25% slopes POOR: 25+% slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
350G			
Mitten	POOR: Steep slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
Entente Variant	POOR: Steep slopes	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
350C			
Mitten	GOOD	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
Mission Variant	FAIR: Low strength	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
250F			
Mitten	POOR: Steep slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
Sharrott Variant	POOR: Steep slopes, shallow depth to bedrock	IMPROBABLE: Thin layer, small stones, excess fines	IMPROBABLE: Thin layer, excess fines
300			
Pits, gravel	Properties are too variable to rate.		
100			
Riverwash	Properties are too variable to rate.		
400			
Rock outcrop	Properties are too variable to rate.		
200			
Rubble land	Properties are too variable to rate.		

TABLE 4--CONSTRUCTION MATERIALS

Map Symbol and Soil Name	Roadfill	Sand (Probable or Improbable Source)	Gravel (Probable or Improbable Source)
331B, 331C			
Savenac Variant	FAIR to POOR: Low strength	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
Mission Variant	FAIR: Low strength	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
21B, 21C, 21E			
Selon Variant	FAIR to GOOD: 0 to 8% slopes--low strength, GOOD below 52 inches FAIR: 15 to 25% slopes POOR: 25+% slopes	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
6B			
Selon Variant	FAIR to GOOD: Low strength, GOOD below 52 inches	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
Yellowbay	GOOD	IMPROBABLE: Small stones	PROBABLE: Below 26 inches
152G			
Sharrott Variant	POOR: Steep slopes, shallow depth to bedrock	IMPROBABLE: Thin layer, small stones, excess fines	IMPROBABLE: Thin layer, excess fines
Mitten	POOR: Steep slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
Rock outcrop	Properties are too variable to rate.		
252G			
Sharrott Variant	POOR: Steep slopes, shallow depth to bedrock	IMPROBABLE: Thin layer, small stones, excess fines	IMPROBABLE: Thin layer, excess fines
Rock outcrop	Properties are too variable to rate.		
Tevis	POOR: Steep slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
2A			
Somers Variant	FAIR: Low strength, seasonal high water table at 10 to 30 inches	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
3A			
Stryker Variant	POOR: Low strength, seasonal high water table at 8 to 20 inches	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
161F			
Tevis	POOR: Steep slopes	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines

TABLE 4--CONSTRUCTION MATERIALS

Map Symbol and Soil Name	Roadfill	Sand (Probable or Improbable Source)	Gravel (Probable or Improbable Source)
161F (continued) Yellowbay	POOR: Steep slopes	IMPROBABLE: Small stones	PROBABLE: Below 26 inches
1A Udifluvents	Properties are too variable to rate.		
7B Waits Variant	FAIR: Low strength	IMPROBABLE: Excess fines	IMPROBABLE: Excess fines
4B Yellowbay	GOOD	IMPROBABLE: Small stones, excess fines	IMPROBABLE: Excess fines
11B Yellowbay	GOOD	IMPROBABLE: Small stones	PROBABLE: Below 26 inches

SOIL PROPERTIES

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps.

Estimates of soil properties are based on field examinations and on laboratory tests of samples of similar soils in other areas.

The estimates of soil properties shown in the tables include the engineering classifications and the physical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Properties and Physical Properties

Table 5 gives estimates of the engineering classification for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added; for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system[1] and the system adopted by the American Association of State Highway and Transportation Officials[2].

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification; for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of

seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse-grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine-grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Table 5 also shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

TABLE 5--ENGINEERING CLASSIFICATION AND PHYSICAL PROPERTIES

(The symbol > means greater than. Absence of an entry means data were not estimated.)

Map Symbol and Soil Name	Depth Inches	Texture	Classification		Permeability In/hr.	Available Water Capacity In/in.	Shrink-swell Potential
			Unified	AASHTO			
5B							
Antero Variant	0-40	Sandy loam, fine sandy loam	SM	A-2	2.0-6.0	0.13-0.16	Low
	40-60	Stratified: Loamy fine sand, very fine sandy loam, silt loam	SM	A-2,A-4	0.6-2.0	0.13-0.16	Low
9B							
Argenta Variant	0-28	Fine sandy loam, sandy loam	SM	A-2	2.0-6.0	0.13-0.16	Low
	28-42	Very gravelly sandy loam	GM	A-2	2.0-6.0	0.03-0.04	Low
	42-60	Extremely gravelly sand	GW	A-1	6.0-20.0	0.01-0.02	Low
40C, 40D, 40E							
Courville	0-8	Gravelly silt loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	8-20	Very gravelly sandy loam	SM , GM	A-2	2.0-6.0	0.07-0.08	Low
	20-60	Very gravelly loam	GM	A-2	0.6-2.0	0.09-0.11	Low
140F							
Courville	0-8	Gravelly silt loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	8-20	Very gravelly sandy loam	SM, GM	A-2	2.0-6.0	0.07-0.08	Low
	20-60	Very gravelly loam	GM	A-2	0.6-2.0	0.09-0.11	Low
Mitten	0-10	Gravelly silt loam, gravelly loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	10-60	Extremely gravelly sandy loam, extremely gravelly loam	GM	A-2	2.0-6.0	0.04-0.05	Low
340D							
Courville	0-8	Gravelly silt loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	8-20	Very gravelly sandy loam	SM, GM	A-2	2.0-6.0	0.07-0.08	Low
	20-60	Very gravelly loam	GM	A-2	0.6-2.0	0.09-0.11	Low
164E							
Entente Variant	0-60	Silt loam	ML	A-4	0.6-2.0	0.18-0.20	Low
Selon Variant	0-11	Very fine sand loam	ML	A-4	0.6-2.0	0.17-0.20	Low
	11-52	Fine sand loam, sandy loam	SM	A-2,A-4	0.6-2.0	0.13-0.16	Low
	52-60	Loamy sand	SM	A-2	2.0-6.0	0.06-0.12	Low
10B, 10C, 10D							
Glaciercreek	0-10	Gravelly silt loam	ML	A-4	0.6-2.0	0.16-0.20	Low
	10-30	Extremely gravelly loamy sand	GM-GP	A-1	2.0-6.0	0.02-0.04	Low
	30-60	Extremely gravelly sand	GP	A-1	6.0-20.0	0.01-0.02	Low

TABLE 5--ENGINEERING CLASSIFICATION AND PHYSICAL PROPERTIES

Map Symbol and Soil Name	Depth Inches	Texture	Classification Unified	Classification AASHTO	Permeability In/hr.	Available Water Capacity In/in.	Shrink-swell Potential
210D, 210E							
Glaciercreek	0-10	Gravelly silt loam	ML	A-4	0.6-2.0	0.16-0.20	Low
	10-30	Extremely gravelly loamy sand	GM-GP	A-1	2.0-6.0	0.02-0.04	Low
	30-60	Extremely gravelly sand	GP	A-1	6.0-20.0	0.01-0.02	Low
Courville	0-8	Gravelly silt loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	8-20	Very gravelly sandy loam	SM, GM	A-2	2.0-6.0	0.07-0.08	Low
	20-60	Very gravelly loam	GM	A-2	0.6-2.0	0.09-0.11	Low
163F							
Glaciercreek	0-10	Gravelly silt loam	ML	A-4	0.6-2.0	0.16-0.20	Low
	10-30	Extremely gravelly loamy sand	GM-GP	A-1	2.0-6.0	0.02-0.04	Low
	30-60	Extremely gravelly sand	GP	A-1	6.0-20.0	0.01-0.02	Low
Yellowbay	0-8	Gravelly sandy loam	SM	A-2	2.0-6.0	0.14-0.16	Low
	8-26	Very gravelly sandy loam	GM	A-2	6.0-20.0	0.07-0.08	Low
	26-60	Extremely cobbly sand	GP	A-1	> 20.0	0.01-0.02	Low
30B, 30E, 165F							
Halfmoon	0-21	Silt loam	ML	A-4	0.6-2.0	0.18-0.20	Low
	21-42	Silty clay loam, silt loam	ML, CL	A-4,A-6	0.2-0.6	0.18-0.20	Low to Moderate
	42-60	Loamy fine sand	SM	A-2	2.0-6.0	0.06-0.12	Low
131E							
Kraft Variant	0-22	Silt loam	ML	A-4	0.6-2.0	0.18-0.20	Low
	22-60	Very gravelly loam, very gravelly clay loam	GM, GC	A-4,A-6	0.2-0.6	0.10-0.12	Low to Moderate
Mission Variant	0-36	Silt loam	ML	A-4	0.2-0.6	0.18-0.20	Low
	36-60	Very gravelly loam	GM	A-4	0.2-0.6	0.09-0.11	Low
600							
Made land	Properties are too variable to rate.						
500							
Marsh land	Properties are too variable to rate.						
20B, 162F							
McCaffery Variant	0-42	Loamy sand	SM	A-2	2.0-6.0	0.08-0.12	Low
	42-60	Sand	SP	A-1	6.0-20.0	0.04-0.06	Low
Selon Variant	0-11	Very fine sandy loam	ML	A-4	0.6-2.0	0.17-0.20	Low
	11-52	Fine sandy loam, sandy loam	SM	A-2,A-4	0.6-2.0	0.13-0.16	Low
	52-60	Loamy sand	SM	A-2	2.0-6.0	0.06-0.12	Low

TABLE 5--ENGINEERING CLASSIFICATION AND PHYSICAL PROPERTIES

Map Symbol and Soil Name	Depth Inches	Texture	Classification		Permeability In/hr.	Available Water Capacity In/in.	Shrink-swell Potential
			Unified	AASHTO			
31B, 31D							
Mission Variant	0-60	Silt loam	ML	A-4	0.2-0.6	0.18-0.20	Low
131C							
Mission Variant	0-36	Silt loam	ML	A-4	0.2-0.6	0.18-0.20	Low
	36-60	Very gravelly loam	GM	A-4	0.2-0.6	0.09-0.11	Low
431B							
Mission Variant	0-60	Silt loam	ML	A-4	0.2-0.6	0.18-0.20	Low
Glaciercreek	0-10	Gravelly silt loam	ML	A-4	0.6-2.0	0.16-0.20	Low
	10-30	Extremely gravelly loamy sand	GM-GP	A-1	2.0-6.0	0.02-0.04	Low
	30-60	Extremely gravelly sand	GP	A-1	6.0-20.0	0.01-0.02	Low
Kraft Variant	0-22	Silt loam	ML	A-4	0.6-2.0	0.18-0.20	Low
	22-60	Very gravelly loam, very gravelly clay loam	GM, GC	A-4,A-6	0.2-0.6	0.10-0.12	Low to Moderate
231B							
Mission Variant	0-60	Silt loam	ML	A-4	0.2-0.6	0.18-0.20	Low
Somers Variant	0-60	Silt loam, very fine sandy loam	ML	A-4	0.6-2.0	0.18-0.20	Low
150E, 150F							
Mitten	0-10	Gravelly silt loam, gravelly loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	10-60	Extremely gravelly sandy loam, extremely gravelly loam	GM	A-2	2.0-6.0	0.04-0.05	Low
Courville	0-8	Gravelly silt loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	8-20	Very gravelly sandy loam	SM, GM	A-2	2.0-6.0	0.07-0.08	Low
	20-60	Very gravelly loam	GM	A-2	0.6-2.0	0.09-0.11	Low
350G							
Mitten	0-10	Gravelly silt loam, gravelly loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	10-60	Extremely gravelly sandy loam, extremely gravelly loam	GM	A-2	2.0-6.0	0.04-0.05	Low
Entent Variant	0-60	Silt loam	ML	A-4	0.6-2.0	0.18-0.20	Low
350C							
Mitten	0-10	Gravelly silt loam, gravelly loam	ML	A-4	0.6-2.0	0.18-0.22.	Low
	10-60	Extremely gravelly sandy loam, extremely gravelly loam	GM	A-2	2.0-6.0	0.04-0.05	Low
Mission Variant	0-60	Silt loam	ML	A-4	0.2-0.6	0.18-0.20	Low

TABLE 5--ENGINEERING CLASSIFICATION AND PHYSICAL PROPERTIES

Map Symbol and Soil Name	Depth Inches	Texture	Classification Unified	Classification AASHTO	Permeability In/hr.	Available Water Capacity In/in.	Shrink-swell Potential
250F							
Mitten	0-10	Gravelly silt loam, gravelly loam	ML	A-4	0.6-2.0	0.18-0.22	Low
	10-60	Extremely gravelly sandy loam, extremely gravelly loam	GM	A-2	2.0-6.0	0.04-0.05	Low
Sharrott	0-8	Gravelly loam, very gravelly loam	ML, GM	A-4, A-2	0.6-2.0	0.09-0.11	Low
	8-18	Extremely gravelly sandy loam	GM	A-2	2.0-6.0	0.04-0.05	Low
	18	Bedrock					
300							
Pits, gravel	Properties are too variable to rate.						
100							
Riverwash	Properties are too variable to rate.						
400							
Rock outcrop	Properties are too variable to rate.						
200							
Rubble land	Properties are too variable to rate.						
331B, 331C							
Savenac Variant	0-60	Silt loam, silty clay loam	ML, CL	A-4,A-6	0.06-0.20	0.18-0.20	Low to Moderate
Mission Variant	0-60	Silt loam	ML	A-4	0.2-0.6	0.18-0.20	Low
21B, 21C, 21E							
Selon Variant	0-11	Very fine sandy loam	ML	A-4	0.6-2.0	0.17-0.20	Low
	11-52	Fine sandy loam, sandy loam	SM	A-2,A-4	0.6-2.0	0.13-0.16	Low
	52-60	Loamy sand	SM	A-2	2.0-6.0	0.06-0.12	Low
6B							
Selon Variant	0-11	Very fine sandy loam	ML	A-4	0.6-2.0	0.17-0.20	Low
	11-52	Fine sandy loam, sandy loam	SM	A-2,A-4	0.6-2.0	0.13-0.16	Low
	52-60	Loamy sand	SM	A-2	2.0-6.0	0.06-0.12	Low
Yellowbay	0-8	Gravelly sandy loam	SM	A-2	2.0-6.0	0.14-0.16	Low
	8-26	Very gravelly sandy loam	GM	A-2	6.0-20.0	0.07-0.08	Low
	26-60	Extremely cobbly sand	GP	A-1	> 20.0	0.01-0.02	Low
152G							
Sharrott Variant	0-8	Gravelly loam, very gravelly loam	ML, GM	A-4,A-2	0.6-2.0	0.09-0.11	Low
	8-18	Extremely gravelly sandy loam	GM	A-2	2.0-6.0	0.04-0.05	Low
	18	Bedrock					

TABLE 5--ENGINEERING CLASSIFICATION AND PHYSICAL PROPERTIES

Map Symbol and Soil Name	Depth Inches	Texture	Classification		Permeability In/hr.	Available Water Capacity In/in.	Shrink-swell Potential
			Unified	AASHTO			
152G (continued)							
Mitten	0-10	Gravelly silt loam, gravelly loam	ML	A-4	0.6-2.0	0.18-0.20	Low
	10-60	Extremely gravelly sandy loam, extremely gravelly loam	GM	A-2	2.0-6.0	0.04-0.05	Low
Rock outcrop	Properties are too variable to rate.						
252G							
Sharrott Variant	0-8	Gravelly loam, very gravelly loam	ML, GM	A-4,A-2	0.6-2.0	0.09-0.11	Low
	8-18	Extremely gravelly sandy loam	GM	A-2	2.0-6.0	0.04-0.05	Low
	18	Bedrock					
Rock outcrop	Properties are too variable to rate.						
Tevis	0-9	Gravelly loam	ML	A-4	0.6-2.0	0.16-0.18	Low
	9-30	Very gravelly loam	GM	A-2	0.6-2.0	0.09-0.11	Low
	30-60	Extremely gravelly sandy loam	GM	A-1	2.0-6.0	0.04-0.05	Low
2A							
Somers Variant	0-60	Silt loam, very fine sandy loam	ML	A-4	0.6-2.0	0.18-0.20	Low
3A							
Stryker Variant	0-60	Silty clay loam	CL	A-7	0.2-0.6	0.18-0.20	Low to Moderate
161F							
Tevis	0-30	Very gravelly sandy loam, very gravelly loam	GM	A-2	0.6-2.0	0.07-0.10	Low
	30-60	Extremely gravelly sandy loam	GM	A-1	2.0-6.0	0.04-0.05	Low
Yellowbay	0-8	Gravelly sandy loam	SM	A-2	2.0-6.0	0.14-0.16	Low
	8-26	Very gravelly sandy loam	GM	A-2	6.0-20.0	0.07-0.08	Low
	26-60	Extremely cobbly sand	GP	A-1	> 20.0	0.01-0.02	Low
1A							
Udifluvents	Properties are too variable to rate.						
7B							
Waits Variant	0-60	Fine sandy loam	SM, ML	A-4	2.0-6.0	0.13-0.16	Low
4B							
Yellowbay	0-21	Sandy loam	SM	A-2	2.0-6.0	0.11-0.14	Low
	21-60	Extremely gravelly loamy sand	GM	A-1	> 20.0	0.03-0.04	Low

TABLE 5--ENGINEERING CLASSIFICATION AND PHYSICAL PROPERTIES

Map Symbol and Soil Name	Depth Inches	Texture	Classification		Permeability In/hr.	Available Water Capacity In/in.	Shrink-swell Potential
			Unified	AASHTO			
11B							
Yellowbay	0-8	Gravelly sandy loam	SM	A-2	2.0-6.0	0.14-0.16	Low
	8-26	Very gravelly sandy loam	GM	A-2	6.0-20.0	0.07-0.08	Low
	26-60	Extremely cobbly sand	GP	A-1	> 20.0	0.01-0.02	Low

Soil and Water Features

Table 6 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 6 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. None means that flooding is not probable; rare, that it is unlikely but possible under unusual weather conditions; common, that it is likely under normal conditions; occasional, that it occurs on an average of once or less in 2 years; and frequent, that it occurs on an average of more than once in 2 years. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, and long if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in a continuous period (more than 2 weeks) during most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated are the depth to the seasonal high water table; the kind of water table--that is, perched or apparent; and the months of the year that the water table commonly is high.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A perched water table is water standing above an unsaturated zone.

Only saturated zones within a depth of about 6 feet are indicated.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

TABLE 6--SOIL AND WATER FEATURES

(Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "parched." The symbol > means greater than.)

Map Symbol and Soil Name	Flooding			High Water Table			Bedrock Depth Inches	Potential Frost Action
	Frequency	Duration	Months	Depth Inches	Kind	Months		
5B Antero Variant	None	---	---	5-24	Apparent	April-June	> 60	High
9B Argenta Variant	Rare	Brief	April-June	36-60	Apparent	April-June	> 60	High
40C, 40D, 40E Courville	None	---	---	None	---	---	> 60	Low
140F Courville	None	---	---	None	---	---	> 60	Low
Mitten	None	---	---	None	---	---	> 60	Low
340D Courville	None	---	---	None	---	---	> 60	Low
164E Entente Variant	None	---	---	None	---	---	> 60	Moderate
Selon Variant	None	---	---	None	---	---	> 60	Low
10B, 10C, 10D Glaciercreek	None	---	---	None	---	---	> 60	Low
210D, 210E Glaciercreek	None	---	---	None	---	---	> 60	Low
Courville	None	---	---	None	---	---	> 60	Low
163F Glaciercreek	None	---	---	None	---	---	> 60	Low
Yellowbay	None	---	---	None	---	---	> 60	Low
30B, 30E, 165F Halfmoon	None	---	---	None	---	---	> 60	Moderate
131E Kraft Variant	None	---	---	None	---	---	> 60	Moderate
Mission Variant	None	---	---	None	---	---	> 60	Moderate

TABLE 6--SOIL AND WATER FEATURES

Map Symbol and Soil Name	Flooding			High Water Table			Bedrock Depth Inches	Potential Frost Action
	Frequency	Duration	Months	Depth Inches	Kind	Months		
600 Made land	Properties are too variable to rate.							
500 Marsh land	Properties are too variable to rate.							
20B, 162F								
McCaffery Variant	None	---	---	None	---	---	> 60	Low
Selon Variant	None	---	---	None	---	---	> 60	Low
31B, 31D								
Mission Variant	None	---	---	None	---	---	> 60	Moderate
131C								
Mission Variant	None	---	---	None	---	---	> 60	Moderate
431B								
Mission Variant	None	---	---	None	---	---	> 60	Moderate
Glaciercreek	None	---	---	None	---	---	> 60	Low
Kraft Variant	None	---	---	None	---	---	> 60	Moderate
231B								
Mission Variant	None	---	---	None	---	---	> 60	Moderate
Somers Variant	None	---	---	10-30	Apparent	April-June	> 60	High
150E, 150F								
Mitten	None	---	---	None	---	---	> 60	Low
Courville	None	---	---	None	---	---	> 60	Low
350G								
Mitten	None	---	---	None	---	---	> 60	Low
Entente Variant	None	---	---	None	---	---	> 60	Moderate
350C								
Mitten	None	---	---	None	---	---	> 60	Low
Mission Variant	None	---	---	None	---	---	> 60	Moderate

TABLE 6--SOIL AND WATER FEATURES

Map Symbol and Soil Name	Flooding			High Water Table			Bedrock Depth Inches	Potential Frost Action
	Frequency	Duration	Months	Depth Inches	Kind	Months		
250F								
Mitten	None	---	---	None	---	---	> 60	Low
Sharrott	None	---	---	None	---	---	12-20	Low
300								
Pits, gravel	Properties are too variable to rate.							
100								
Riverwash	Properties are too variable to rate.							
400								
Rock outcrop	Properties are too variable to rate.							
200								
Rubble land	Properties are too variable to rate.							
331B, 331C								
Savenac Variant	None	---	---	None	---	---	> 60	Moderate
Mission Variant	None	---	---	None	---	---	> 60	Moderate
21B, 21C, 21E								
Selon Variant	None	---	---	None	---	---	> 60	Low
6B								
Selon Variant	None	---	---	None	---	---	> 60	Low
Yellowbay	None	---	---	None	---	---	> 60	Low
152G								
Sharrott Variant	None	---	---	None	---	---	12-20	Low
Mitten	None	---	---	None	---	---	> 60	Low
Rock outcrop	Properties are too variable to rate.							
252G								
Sharrott Variant	None	---	---	None	---	---	12-20	Low
Rock outcrop	Properties are too variable to rate.							
Tevis	None	---	---	None	---	---	> 60	Low

TABLE 6--SOIL AND WATER FEATURES

Map Symbol and Soil Name	Flooding			High Water Table			Bedrock Depth Inches	Potential Frost Action
	Frequency	Duration	Months	Depth Inches	Kind	Months		
2A Somers Variant	None	---	---	10-30	Apparent	April-June	> 60	High
3A Stryker Variant	None	---	---	8-20	Apparent	April-June	> 60	High
161F Tevis	None	---	---	None	---	---	> 60	Low
Yellowbay	None	---	---	None	---	---	> 60	Low
1A Udifluvents	Occasional	Brief	April-June	36-60	Apparent	April-June	> 60	Low to high
7B Waits Variant	None	---	---	None	---	---	> 60	Moderate
4B Yellowbay	None	---	---	None	---	---	> 60	Low
11B Yellowbay	None	---	---	None	---	---	> 60	Low

CLASSIFICATION OF THE SOILS

The system of soil classification used by the National Cooperative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 7, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in "sol". An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (Aqu, meaning water, plus ent, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (Hapl, meaning minimal horizonation, plus aquent, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceeding the name of the great group. The adjective "Typic" identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

TABLE 7--CLASSIFICATION OF THE SOILS

Soil Name	Family or Higher Taxonomic Class
Antero Variant	Coarse-loamy, mixed, frigid Typic Haplaquepts
Argenta Variant	Coarse-loamy, frigid Aeric Haplaquepts
Courville	Loamy-skeletal, mixed, frigid Andic Dystric Eutrochrepts
Entente Variant	Coarse-silty, mixed, frigid Dystric Eutrochrepts
Glaciercreek	Sandy-skeletal, mixed, frigid Andic Dystric Eutrochrepts
Halfmoon	Fine-silty, mixed, frigid Typic Eutroboralfs
Kraft Variant	Loamy-skeletal, mixed, frigid Typic Paleboralfs
McCaffery Variant	Calcareous, mixed, frigid Typic Udipsamments
Mission Variant	Coarse-silty, mixed, frigid Andic Dystric Eutrochrepts
Mitten	Loamy-skeletal, mixed, frigid Andic Dystric Eutrochrepts
Savenac Variant	Fine-silty, mixed, frigid Typic Eutroboralfs
Selon Variant	Coarse-loamy, mixed, frigid Dystric Eutrochrepts
Sharrott Variant	Loamy-skeletal, mixed, frigid Lithic Eutrochrepts
Somers Variant	Coarse-silty, mixed, frigid Typic Haplaquepts
Stryker Variant	Fine-silty, mixed, frigid Typic Haplaquepts
Tevis	Loamy-skeletal, mixed, frigid Dystric Eutrochrepts
Udifluvents	Udifluvents
Waits Variant	Coarse-loamy, mixed, frigid Typic Eutrochrepts
Yellowbay	Sandy-skeletal, mixed, frigid Dystric Eutrochrepts

SOIL SERIES AND MORPHOLOGY

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual[3]. Many of the technical terms used in the descriptions are defined in Soil Taxonomy[4]. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Soil maps for detailed planning."

ANTERO VARIANT

Antero Variant consists of deep, poorly drained soils that formed in alluvium. They are on terraces at elevations of 2,400 to 2,500 feet. Slopes are 0 to 4 percent. The average annual precipitation is 25 to 35 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Antero Variant fine sandy loam, in pasture; 800 feet west and 500 feet south of the northeast corner of sec. 25, T. 31 N., R. 34 W.

A2--0 to 5 inches; dark gray (5Y 4/1) moist, sandy loam; weak medium granular structure; friable, nonsticky and nonplastic; many fine and very fine roots; neutral; clear smooth boundary.

B2g--5 to 15 inches; gray (5Y 5/1) moist, sandy loam, common distinct yellowish brown (10YR 5/6) moist mottles; moderate medium subangular blocky structure; friable, nonsticky and nonplastic; common fine and very fine roots; neutral; gradual wavy boundary.

B3g--15 to 22 inches; olive gray (5Y 5/2) moist, sandy loam, common medium prominent yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/6) moist mottles; weak medium subangular blocky structure; friable, nonsticky and nonplastic; common very fine roots; neutral; gradual wavy boundary.

C1g--22 to 40 inches; olive gray (5Y 5/2) moist, sandy loam, many medium prominent yellowish brown (10YR 5/6 and 10YR 5/8) moist, mottles; massive; friable, nonsticky and nonplastic; few very fine roots to 30 inches; neutral; gradual wavy boundary.

C2g--40 to 60 inches; gray (5Y 5/1) moist, stratified loamy fine sand, silt loam and very fine sandy loam; massive; friable, nonsticky and nonplastic; neutral.

Depth to seasonal high water table is 5 to 24 inches. Textures of the B2g horizon are fine sandy loam or sandy loam. Textures of the C1 horizon are sandy loam or fine sandy loam. The C2g horizon has thin layers of loamy very fine sand and silt loam in some pedons.

Some pedons have a 2- to 4-inch A1 horizon.

ARGENTA VARIANT

Argenta Variant consists of deep, somewhat poorly drained soils that formed in alluvium. They are on stream terraces at elevations of 2,200 to 2,400 feet. Slopes are 0 to 2 percent. The average annual precipitation is 25 to 35 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Argenta Variant fine sandy loam, in forest; 1,800 feet west and 200 feet south of the of the northeast corner of sec. 31, T. 30 N., R. 22 W.

O1--1 inch to 0; partially decomposed forest litter of needles, twigs, and leaves.

A2--0 to 6 inches; gray (10YR 6/1) moist, fine sandy loam; moderate medium granular structure; very friable, slightly sticky and nonplastic; common medium and fine roots; neutral; clear smooth boundary.

B21--6 to 14 inches; olive (5Y 5/3) moist, fine sandy loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic; common fine roots; neutral; gradual smooth boundary.

B22--14 to 28 inches; olive gray (5Y 5/2) moist, sandy loam; weak coarse subangular blocky structure; friable, nonsticky and nonplastic; few fine and very fine roots; neutral; clear wavy boundary.

IIC1--28 to 42 inches; light olive gray (5Y 6/2) moist, very gravelly sandy loam; massive; very friable, nonsticky and nonplastic; 45 percent pebbles, 5 percent cobbles; neutral; gradual wavy boundary.

IIC2--42 to 60 inches; light olive gray (5Y 6/2) moist, extremely gravelly sand; single grain; loose, nonsticky and nonplastic; 70 percent pebbles, 5 percent cobbles; neutral.

Depth to the IIC1 horizon is 28 to 32 inches. Coarse fragments in the IIC horizon is 45 to 80 percent. In grassland, thin A1 horizons are present in some pedons. Yellowish brown (10YR 5/4 and 10YR 5/6) moist mottles are in some pedons in the A2 and B2 horizons. Depth to the seasonal high water table is 36 to 60 inches.

COURVILLE SERIES

Courville consists of deep, well drained soils that formed in glacial till or colluvium with a surface mantle of volcanic ash influenced loess. They are on sides of mountains and foot slopes at elevations of 2,000 to 4,000 feet. Slopes are 4 to 60 percent. The average annual precipitation is 30 to 45 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Courville gravelly silt loam, in forest; 1,800 feet west and 400 feet south of the northeast corner of sec. 35 N, T. 31 N., R. 34 W.

O1--1 inch to 0; mostly undecomposed forest litter of needles and twigs.

B2--0 to 8 inches; dark brown (7.5YR 4/4) moist, gravelly silt loam; weak medium granular structure; soft, friable, nonsticky and nonplastic; many medium and fine roots; 15 percent pebbles; slightly acid; clear smooth boundary.

IIA&B--8 to 20 inches; 55 percent brown (10YR 5/3) and 45 percent dark yellowish brown (10YR 4/4) moist, very gravelly sandy loam; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine roots; 35 percent pebbles, 10 percent cobbles and stones; slightly acid; gradual wavy boundary.

IIB&A--20 to 60 inches; 60 percent dark yellowish brown (10YR 4/4) and 40 percent brown (10YR 5/3) moist, very gravelly loam; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; 40 percent pebbles, 10 percent cobbles and stones; slightly acid.

The B2 horizon is 7 to 12 inches thick. Some pedons have a IIA2 horizon below the B2 horizon. Coarse fragments in the IIA&B and IIB&A horizons is 35 to 55 percent and are mainly pebbles and cobbles.

ENTENTE VARIANT

Entente Variant consists of deep, well drained soils that formed in lacustrine. They are on terrace edges at elevations of 2,000 to 2,800 feet. Slopes are 15 to 60 percent. The average annual precipitation is 30 to 40 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Entente Variant silt loam, in forest; 2,200 feet north and 400 feet east of the southwest corner of sec. 34, T. 31 N., R. 33 W.

O1--2 inches to 0; mostly undecomposed forest litter.

A21--0 to 6 inches; brown (10YR 5/3) moist, silt loam, weak medium granular structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; slightly acid; clear wavy boundary.

A22--6 to 14 inches; light brownish gray (10YR 6/2) moist, silt loam, weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many fine roots and common medium and coarse roots; slightly acid; gradual wavy boundary.

A&B--14 to 60 inches; 85 percent light brownish gray (10YR 6/2) and 15 percent yellowish brown (10YR 5/4) moist, silt loam; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common medium and fine roots above 30 inches, few roots below; slightly acid.

Textures throughout the profile are silt loam or very fine sandy loam with 8 to 18 percent clay.

GLACIERCREEK SERIES

Glaciercreek series consists of deep, well drained soils that formed in alluvium and have a surface mantle of volcanic ash influenced loess. They are on terraces and terrace edges at elevations of 1,800 to 2,600 feet. Slopes are 0 to 60 percent. The average annual precipitation is 25 to 40 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 70 to 90 days.

Typical pedon of Glaciercreek gravelly silt loam, in forest; 2,100 feet west and 300 feet north of the southeast corner of sec. 35, T. 32 N., R. 34 W.

O1--2 inches to 0; forest litter.

B21--0 to 5 inches; dark yellowish brown (10YR 4/4) moist, gravelly silt loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common coarse and medium roots and many fine roots; 15 percent pebbles; slightly acid; gradual smooth boundary.

B22--5 to 10 inches; dark yellowish brown (10YR 4/4) moist, gravelly silt loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common coarse and medium roots and many fine roots; 20 percent pebbles; slightly acid; gradual smooth boundary.

IIA2--10 to 17 inches; dark yellowish brown (10YR 4/4) moist, very gravelly sandy loam; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many fine and very fine roots; 40 percent pebbles; slightly acid; clear wavy boundary.

IIA&B--17 to 30 inches; 65 percent light yellowish brown (10YR 6/4) and 35 percent yellowish brown (10YR 5/4) moist extremely gravelly loamy sand; single grain; loose; nonsticky and nonplastic; many fine and very fine roots; 85 percent pebbles; slightly acid; gradual wavy boundary.

IIIC1--30 to 60 inches; yellowish brown (10YR 5/4) moist, extremely gravelly sand; single grain; loose, nonsticky and nonplastic; few fine and very fine roots to 48 inches; 85 percent pebbles; slightly acid.

Textures of the less-than-2 millimeter fine earth fraction are typically silt loam in the B2 horizons, sandy loam in the IIA2 horizons, loamy sand in the IIA&B horizons, and sand or loamy sand in the C horizons.

Typically, the distribution of coarse fragments is 5 to 25 percent in the B2 horizons, 35 to 60 percent in the IIA2 and upper IIA&B horizons, and 55 to 85 percent in the deeper IIA&B and IIIC horizons.

HALF MOON SERIES

The Half Moon series consists of deep, well drained soils that formed in lacustrine. They are on terraces and terrace edges at elevations of 2,000 to 2,400 feet. Slopes are 0 to 60 percent. The average annual precipitation is 30 to 45 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Half Moon silt loam, in forest; 1,900 feet east and 600 feet north of the southwest corner of sec. 15, T. 32 N., R. 34 W.

O1--2 inches to 0; mainly undecomposed forest litter of needles and twigs.

A2--0 to 17 inches; brown (10YR 5/3) moist, silt loam; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many fine roots and common medium roots; medium acid; clear wavy boundary.

A&B--17 to 21 inches; 50 percent brown (10YR 5/3) and 50 percent dark yellowish brown (10YR 4/4) moist, silt loam; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common medium and fine roots; slightly acid; gradual wavy boundary.

B2t--21 to 30 inches; dark yellowish brown (10YR 4/4) moist, light silty clay loam; moderate coarse prismatic structure parting to strong medium subangular blocky; hard, firm, slightly sticky and plastic; few moderately thick clay films on faces of peds and in pores; common medium and fine roots; neutral; gradual wavy boundary.

C1ca--30 to 42 inches; light olive brown (2.5Y 5/4) moist, silt loam; massive; slightly hard, friable, nonsticky and nonplastic; few fine and very fine roots; common fine threadlike masses of lime; strongly effervescent; neutral; clear wavy boundary.

IIC2--42 to 60 inches; grayish brown (2.5Y 5/2) moist, loamy fine sand; massive; soft, very friable, nonsticky and nonplastic; few very fine roots to 50 inches; slightly effervescent; neutral.

Depth to the B2t horizon is 15 to 23 inches. Depth to carbonates is 25 to 35 inches. Some pedons have a B3ca horizon. Texture of the B2t horizon is heavy silt loam, light silty clay loam, or silty clay loam. Some pedons have weakly expressed varves. Some pedons have thin lenses of very fine sand, very fine sandy loam, and silt loam in the C horizons.

KRAFT VARIANT

Kraft Variant consists of deep, well drained soils that formed in lacustrine over loamy glacial till. They have a surface mantle of volcanic ash influenced loess. They are on terraces, terrace edges, and moraines at elevations of 2,000 to 2,800 feet. Slopes are 2 to 30 percent. The average annual precipitation is 30 to 40 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Kraft Variant silt loam, in forest; 1,700 feet north and 1,200 feet east of the southwest corner of sec. 19, T. 31 N., R. 33 W.

O1--2 inches to 0; mostly undecomposed forest litter.

A2--0 to 1 inch; light gray (10YR 7/2) moist, silt loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many coarse to fine roots; clear smooth boundary; neutral; this horizon is discontinuous in places.

B2--1 to 5 inches; yellowish brown (10YR 5/4) moist, silt loam; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many coarse to very fine roots; neutral; gradual smooth boundary.

IIA21--5 to 10 inches; yellowish brown (10YR 5/4) moist; silt loam; moderate fine subangular blocky structure; soft, friable, nonsticky and nonplastic; common coarse to very fine roots; neutral; clear wavy boundary.

IIA22--10 to 22 inches; light yellowish brown (2.5Y 4/4) moist; silt loam; moderate medium angular blocky structure; slightly hard, firm, nonsticky and nonplastic; common coarse to very fine roots; neutral; clear wavy boundary.

IIIA&B--22 to 30 inches; 70 percent pale brown (10YR 6/3) moist; and 30 percent dark yellowish brown (10YR 4/4) moist, very gravelly loam; strong coarse angular blocky structure; hard, very firm, slightly sticky and slightly plastic; common medium and fine roots; 30 percent pebbles, 10 percent cobbles and stones; neutral; gradual wavy boundary.

IIIB&A--30 to 38 inches; 60 percent dark yellowish brown (10YR 4/4) and 40 percent pale brown (10YR 6/3) moist, very gravelly heavy loam; strong coarse angular blocky structure; very hard, firm, sticky and plastic; few medium and fine roots; common thin and moderately thick clay films on faces of peds, on coarse fragments, and in pores; 35 percent pebbles, 15 percent cobbles and stones; neutral; clear wavy boundary.

IIIB2t--38 to 60 inches; light olive brown (2.5Y 5/4) moist, very gravelly light clay loam; strong coarse and medium angular blocky structure; very hard, very firm, sticky and plastic; few fine and very fine roots, mostly around coarse fragments; many moderately thick clay films on faces of peds, on coarse fragments, and in pores; 40 percent pebbles, 10 percent cobbles and stones; neutral.

Clay content is 8 to 15 percent in the A2, B2, IIA21, and IIA22 horizons; 15 to 25 percent in the IIIA&B and IIIB&A horizons; and 25 to 35 percent in the IIIB2t horizon. Coarse fragment content is 40 to 60 percent in the glacial till below the IIA22 horizon.

MCCAFFERY VARIANT

McCaffery Variant consists of deep, somewhat excessively drained soils that formed in alluvium on terraces and terrace edges. They are on uplands at elevations of 2,200 to 2,400 feet. Slopes are 0 to 60 percent. The average annual precipitation is 30 to 45 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of McCaffery Variant sandy loam, in forest; 500 feet south and 2,000 feet west of the northeast corner of sec. 22, T. 31 N., R. 33 W.

O1--2 inches to 0; partly decomposed forest litter.

A2--0 to 6 inches; dark brown (10YR 6/3) moist, sandy loam; moderate medium and fine granular structure; slightly hard, friable, nonsticky and nonplastic; common medium and fine roots; neutral; clear smooth boundary.

B2--6 to 17 inches; dark yellowish brown (10YR 5/4) moist, loamy sand; weak medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common medium and fine roots; neutral; gradual smooth boundary.

C1ca--17 to 42 inches; dark grayish brown (10YR 5/3) moist, loamy sand; massive; loose, nonsticky and nonplastic; few medium and fine roots to 25 inches; strongly effervescent; mildly alkaline; gradual irregular boundary.

C2--42 to 60 inches; dark grayish brown (10YR 4/2) moist, sand; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline.

Depth to the C1ca horizon is 14 to 30 inches. The C1ca horizon is loamy sand or sand, and the sand fraction is mainly fine sands. The C2 horizon is mainly fine and medium sand. A few pebbles are in the C horizons of some pedons. Some pedons have a B3ca horizon.

MISSION VARIANT

Mission Variant consists of deep, well drained soils that formed in lacustrine. They have a surface mantle of volcanic ash influenced loess. They are on terraces in uplands at elevations of 2,000 to 2,800 feet. Slopes are 0 to 30 percent. The average annual precipitation is 30 to 45 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Mission Variant silt loam, in forest; 1,300 feet south and 50 feet west of the northeast corner of sec. 6, T. 30 N., R. 33 W.

O1--2 inches to 0; mostly decomposed forest litter.

B2--0 to 13 inches; dark yellowish brown (10YR 4/4) moist, silt loam; weak medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine to coarse roots; neutral; clear wavy boundary.

IIA2--13 to 23 inches; light brownish gray (2.5Y 6/2) moist, silt loam; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine and fine roots; neutral; gradual wavy boundary.

IIA&B--23 to 36 inches; 65 percent light brownish gray (2.5Y 6/2) moist, silt loam, 35 percent light olive brown (2.5Y 5/4) moist, silt loam; strong coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; common fine and medium roots and few very fine roots; neutral; gradual wavy boundary.

IIC1--36 to 60 inches; light brownish gray (2.5Y 6/2) moist, silt loam, massive; slightly hard, frible, slightly sticky and slightly plastic; few fine roots; neutral.

The B2 horizon is low bulk density volcanic ash influenced loess 8 to 14 inches thick. The substrata may be weakly varved or massive. Some pedons have loamy fine sand strata below a depth of 40 inches.

MITTEN SERIES

The Mitten series consists of deep, well drained soils that formed in colluvium derived from argillite and quartzite rock. They have a surface mantle of volcanic ash influenced loess. They are on sides of mountains and foot slopes at elevations of 1,900 to 4,000 feet. Slopes are 5 to 75 percent. The average annual precipitation is 30 to 45 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Mitten gravelly silt loam, in forest; 2,000 feet south and 1,400 feet west of the northeast corner of sec. 16, T. 30 N., R. 33 W.

O2-1 inch to 0; mostly decomposed forest litter.

B2--0 to 10 inches; dark yellowish brown (10YR 4/4) moist; gravelly silt loam, weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; 15 percent pebbles; slightly acid; clear wavy boundary.

IIA2--10 to 19 inches; brown (10YR 5/3) moist, very gravelly sandy loam; weak coarse granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots and common medium and coarse roots; 55 percent pebbles; slightly acid; gradual wavy boundary.

IIA&B--19 to 43 inches; 75 percent light yellowish brown (2.5Y 6/4) moist, and 25 percent light olive brown (2.5Y 5/6) extremely gravelly sandy loam, light yellowish brown moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine, fine, medium, and coarse roots; 65 percent pebbles with a few cobbles; neutral; gradual wavy boundary.

C1--43 to 60 inches; light yellowish brown (2.5Y 6/4) moist, extremely gravelly sandy loam; massive; soft, friable, nonsticky and nonplastic; common medium and fine roots and few coarse and very fine roots; 60 percent pebbles, 15 percent cobbles; neutral.

In some pedons, the loess surface layer is mixed with cobbles and stones. The soils contain 50 to 80 percent rock fragments, consisting mainly of pebbles and cobbles. Texture of the less-than-2-millimeter fine earth fraction is mainly silt loam or loam in the B2 horizon and sandy loam, fine sandy loam, or loam in the IIA2, IIA&B, and C horizons.

SAVENAC VARIANT

Savenac Variant consists of deep, well drained soils that formed in lacustrine. They have a surface mantle of volcanic ash influenced loess. They are on terraces at elevations of 2,000 to 2,800 feet. Slopes are 0 to 10 percent. The average annual precipitation is 35 to 40 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Savenac Variant silt loam, in forest; approximately 1,700 feet north and 2,100 feet west of the southeast corner of sec. 17, T. 30 N., R. 33 W.

O2--3 inches to 0; mostly decomposed forest litter.

A2--0 to 1 inch; light gray (10YR 7/2) moist, silt loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many coarse, medium, and fine roots; slightly acid; clear wavy boundary.

B2--1 to 11 inches; brown (7.5YR 4/4) moist, silt loam; weak coarse subangular blocky structure parting to medium and fine granular; soft, very friable, nonsticky and nonplastic; many coarse, medium, and fine roots; slightly acid; clear smooth boundary.

IIA2--11 to 19 inches; very pale brown (10YR 7/3) moist, silt loam; weak angular blocky structure; slightly hard, friable, nonsticky and nonplastic; common medium and fine roots; slightly acid; gradual wavy boundary.

IIB&A--19 to 32 inches; 65 percent light yellowish brown (10YR 6/4) moist, heavy silt loam; light yellowish brown (10YR 7/3) moist; 35 percent light yellowish brown (10YR 7/3) moist; strong coarse subangular blocky structure; very hard, firm, sticky and plastic; common medium and fine roots; slightly acid; gradual wavy boundary.

IIB21t--32 to 60 inches; light yellowish brown (10YR 6/4) moist, silty clay loam; moderate medium prismatic structure; very hard, firm, sticky and plastic; common medium and fine roots; neutral; gradual wavy boundary.

IIB22t--60 to 72 inches; pale brown (10YR 6/3) moist, silty clay loam; moderate medium angular blocky structure above 65 inches, weakly varved below; very hard, firm, sticky and plastic; few medium and fine roots; neutral.

The B2 horizon is 8 to 13 inches thick. Depth to the IIB2t or IIB&A horizon is 18 to 24 inches. The IIB2t horizon is heavy silt loam or silty clay loam with 18 to 35 percent clay. The IIA2 and IIB&A horizons are silt loam or very fine sandy loam with 10 to 18 percent clay.

SELON VARIANT

Selon Variant consists of deep, well drained soils that formed in alluvium or colluvium. They are on terraces and terrace edges at elevations of 1,900 to 3,000 feet. Slopes are 0 to 60 percent. The average annual precipitation is 30 to 40 inches, the mean annual air temperature is 40 to 44 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Selon Variant fine sandy loam, in mixed forest; 900 feet east and 1,200 feet south of the northwest corner of sec. 5, T. 30 N., R. 33 W.

O1--2 inches to 0; partly decomposed mat of needles, twigs, and leaves.

A21--0 to 11 inches; dark yellowish brown (10YR 4/2) moist, very fine sandy loam; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; many coarse to very fine roots; slightly acid; clear wavy boundary.

A22--11 to 26 inches; brown (10YR 5/3) moist, fine sandy loam; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common coarse, medium, and fine roots; slightly acid; gradual wavy boundary.

A&B--26 to 38 inches; 70 percent dark brown (10YR 4/3) moist, and 30 percent dark brown (7.5YR 4/4) moist, sandy loam; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common coarse, medium, and fine roots; common fine nodules of manganese; slightly acid; gradual wavy boundary.

B&A--38 to 52 inches; 60 percent dark brown (7.5YR 4/4) moist, and 40 percent dark brown (10YR 4/3) moist, sandy loam; moderate medium angular blocky structure; slightly hard, friable, nonsticky and nonplastic; few medium and fine roots; common fine nodules of manganese; slightly acid; gradual wavy boundary.

C1--52 to 60 inches; dark grayish brown (2.5Y 6/2) moist, loamy sand; massive; soft, loose, nonsticky and nonplastic; neutral.

The A21 horizon is very fine sandy loam to sandy loam. Some pedons have black manganese nodules 1 to 5 mm in size. In most areas the subsoil has dark brown thin continuous wavy bands of fine sandy loam (lomella) 1/4 to 1/2 inches thick.

SHARROTT VARIANT

Sharrott Variant consists of shallow, somewhat excessively drained soils that formed in residuum from argillite and quartzite rock. They are on steep and very steep sides of mountains at elevations of 2,000 to 4,000 feet. Slopes are 45 to 75 percent. The average annual precipitation is 30 to 40 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Sharrott Variant gravelly loam, in forest; 1,900 feet west and 2,000 feet north of the southeast corner of sec. 1, T. 30 N., R. 34 W.

O1--2 inches to 0; forest litter of undecomposed needles, twigs, and leaves.

A21--0 to 3 inches; dark yellowish brown (10YR 4/4) moist, gravelly loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many medium and fine roots; 25 percent pebbles and 5 percent cobbles; slightly acid; gradual smooth boundary.

A22--3 to 8 inches; yellowish brown (10YR 6/3) moist, very gravelly loam; moderate fine granular structure; slightly hard, friable, nonsticky and slightly plastic; many medium and fine roots; 35 percent pebbles and 5 percent cobbles; slightly acid; gradual wavy boundary.

A&B--8 to 18 inches; 60 percent yellowish brown (10YR 5/4) moist, and 40 percent dark yellowish brown (10YR 4/4) moist, extremely gravelly sandy loam; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium roots and many fine and very fine roots; 50 percent pebbles and 10 percent cobbles; slightly acid.

R--28 inches; unweathered argilliceous quartzitic bedrock.

Depth to unweathered bedrock is 12 to 20 inches.

SOMERS VARIANT

Somers Variant consists of deep, poorly drained soils that formed in alluvium. They are on terraces at elevations of 2,400 to 2,700 feet. Slopes are 0 to 2 percent. The average annual precipitation is 25 to 35 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Somers Variant silt loam, in forest; 2,500 feet west and 2,000 feet north of the southeast corner of sec. 36, T. 31 N., R. 34 W.

O1--2 inches to 0; partially decomposed forest litter of twigs, needles, and leaves.

A1--0 to 3 inches; very dark gray (10YR 3/1) moist, silt loam; weak medium granular structure; very friable, slightly sticky and slightly plastic; common medium roots; neutral; clear wavy boundary.

A2--3 to 8 inches; gray (2.5Y 5/1) moist, silt loam; weak medium granular structure; very friable, slightly sticky and slightly plastic; common medium and fine roots; neutral; clear smooth boundary.

B2--8 to 18 inches; dark grayish brown (2.5Y 4/2) moist, silt loam; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; common medium and fine roots; neutral; gradual wavy boundary.

C1g--18 to 36 inches; olive gray (5Y 5/2) moist, silt loam; massive; friable, slightly sticky and slightly plastic; few very fine roots; neutral; gradual wavy boundary.

C2g--36 to 60 inches; olive gray (5Y 3/2) moist, very fine sandy loam; massive; very friable, nonsticky and nonplastic; neutral.

The A1 horizon is not present in some pedons. Lenses of silty clay loam or fine sandy loam are in some pedons below a depth of 40 inches. Olive yellow (2.5Y 6/6) and yellowish brown (10YR 5/4) mottles are in some pedons in the A2 and B2 horizons. Depth to the seasonal high water table is 10 to 30 inches.

STRYKER VARIANT

Stryker Variant consists of deep, poorly drained soils that formed in alluvium. They are on terraces at elevations of 2,300 to 2,400 feet. Slopes are 0 to 2 percent. The average annual precipitation is 30 to 40 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Stryker Variant, in grasses and sedges; 100 feet east and 50 feet north of the southwest corner of sec. 8, T. 29 N., R. 33 W.

O1--3 inches to 0; mostly partially decomposed litter of bulrushes, sedges, and grasses.

A11--0 to 3 inches; black (10YR 2/1) moist, silt loam; moderate medium granular structure; friable, slightly sticky and slightly plastic; many fine roots and common medium roots; neutral; clear smooth boundary.

A12--3 to 8 inches; dark grayish brown (2.5Y 4/2) moist, silty clay loam; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear wavy boundary.

B21g--8 to 14 inches; olive gray (5Y 4/2) moist, silty clay loam, few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm, sticky and slightly plastic; common fine and very fine roots; neutral; gradual wavy boundary.

B22g--14 to 28 inches; olive gray (5Y 5/2) moist, silty clay loam, common fine prominent yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm, sticky and slightly plastic; few very fine roots; neutral; gradual wavy boundary.

C1g--28 to 44 inches; gray (5Y 5/1) moist, silty clay loam, many coarse prominent yellowish brown (10YR 5/6 and 10YR 5/8) mottles; massive; firm, sticky and plastic; neutral; gradual wavy boundary.

C2g--44 to 60 inches; stratified gray (5Y 5/1) moist, silty clay loam and olive gray (5Y 5/2) moist, fine sandy loam, many medium prominent yellowish brown (10YR 5/6 and 10YR 5/8) mottles; massive; firm, slightly sticky and slightly plastic; neutral.

The A11 horizon is 2 to 5 inches thick. Thin layers of silty clay or loamy fine sand are in some pedons below a depth of 40 inches. Depth to a seasonal water table is 8 to 20 inches.

TEVIS SERIES

The Tevis Series consists of deep, well drained soils that formed in colluvium derived from argillite and quartzite rock. They are on steep and very steep mountain slopes and terrace edges at elevations of 2,000 to 4,000 feet. Slopes are 30 to 75 percent. The average annual precipitation is 30 to 40 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Tevis gravelly loam, in forest; 2,000 feet west and 1,800 feet north of the southeast corner of sec. 1, T. 30 N., R. 34 W.

O1--1 inch to 0; undecomposed forest litter of needles and twigs.

A21--0 to 4 inches; dark yellowish brown (10YR 4/4) moist, gravelly loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common coarse and medium roots and many fine roots; 20 percent pebbles; slightly acid; gradual smooth boundary.

A22--4 to 9 inches; yellowish brown (10YR 5/4) moist, gravelly loam; moderate fine granular structure; soft, very friable, nonsticky and slightly plastic; common coarse and medium roots and many fine roots; 15 percent pebbles and 5 percent cobbles; slightly acid; gradual wavy boundary.

A&B--9 to 30 inches; 60 percent brown (10YR 5/3) moist, and 40 percent dark yellowish brown (10YR 4/4) very gravelly loam; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common medium roots and many fine and very fine roots; 45 percent pebbles; slightly acid; gradual wavy boundary.

B&A--30 to 39 inches; 50 percent dark brown (10YR 4/3) and 50 percent brown (10YR 5/3) moist, extremely gravelly loam; moderate coarse and medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common fine and very fine roots; 50 percent pebbles and 10 percent cobbles; slightly acid; diffuse wavy boundary.

C1--39 to 60 inches; dark brown (10YR 4/3) extremely gravelly sandy loam, moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; 60 percent pebbles and 15 percent cobbles; slightly acid.

The A2 horizon is gravelly loam to very gravelly sandy loam. Coarse fragment content in the A&B, B&A, and C1 horizons is 35 to 75 percent. The C1 horizon is weakly calcareous in some pedons below a depth of 40 inches.

WAITS VARIANT

Waits Variant consists of deep, well drained soils that formed in alluvium. They are on stream terraces at elevations of 2,000 to 2,600 feet. Slopes are 0 to 4 percent. The average annual precipitation is 25 to 35 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 60 to 90 days.

Typical pedon of Waits Variant fine sandy loam, in pasture; 800 feet north and 1,900 feet east of the southwest corner of sec. 16, T. 31 N., R. 33 W.

A1--0 to 5 inches; dark grayish brown (10YR 4/2) moist, fine sandy loam; weak fine granular structure; soft, friable, nonsticky and nonplastic; common medium, fine, and very fine roots; neutral; gradual wavy boundary.

A&B1--5 to 18 inches; 80 percent brown (10YR 5/3) moist, and 20 percent yellowish brown (10YR 5/6) moist, fine sandy loam; moderate medium angular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine and very fine roots; neutral; clear smooth boundary.

A&B2--18 to 35 inches; 55 percent brown (10YR 4/3) moist, and 45 percent dark brown (10YR 3/3) moist, fine sandy loam; 1-inch thick lamella at 23 inches is a heavy fine sandy loam with few thin clay films bridging mineral grains; moderate medium angular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine and very fine roots at 18 to 30 inches and common medium and coarse roots at 30 to 35 inches; neutral; clear smooth boundary.

Cca--35 to 60 inches; dark grayish brown (10YR 4/2) moist, fine sandy loam; massive; very friable, slightly hard, nonsticky and nonplastic; common coarse and medium roots at 35 to 37 inches and few below 37 inches; moderately alkaline; violently effervescent.

The A1 horizon is not present under native forest vegetation. The sand fraction is mostly fine and medium. Depth to the Cca horizon is 28 to 38 inches.

YELLOWBAY SERIES

The Yellowbay series consists of deep, well drained soils that formed in alluvium. They are on terraces and terrace edges at elevations of 1,800 to 2,600 feet. Slopes are 0 to 60 percent. The average annual precipitation is 25 to 35 inches, the mean annual air temperature is 43 to 47 degrees F, and the average frost-free period is 70 to 90 days.

Typical pedon of Yellowbay gravelly sandy loam, in forest; 900 feet west and 500 feet north of the southeast corner of sec. 27, T. 32 N., R. 34 W.

O1--1 inch to 0; forest litter.

A2--0 to 8 inches; brown (10YR 5/3) moist, gravelly sandy loam; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common medium roots and many fine and very fine roots; 25 percent pebbles and 5 percent cobbles; slightly acid; gradual smooth boundary.

A&B--8 to 26 inches; 60 percent brown (10YR 5/3) moist, and 40 percent dark brown (10YR 4/3) moist, very gravelly light sandy loam; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many fine and very fine roots; 40 percent pebbles and 10 percent cobbles; slightly acid; gradual wavy boundary.

C1--26 to 32 inches; dark yellowish brown (10YR 4/4) moist, extremely cobbly loamy sand; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; 50 percent pebbles and 20 percent cobbles; slightly acid; gradual wavy boundary.

C2--32 to 60 inches; dark yellowish brown (10YR 4/4) moist, extremely cobbly sand; single grain; loose, nonsticky and nonplastic; 55 percent pebbles and 25 percent cobbles; slightly acid.

Thin A1 horizons are present in some pedons in grassland areas. The A2 horizon is sandy loam or gravelly sandy loam. Coarse fragment content in the A&B, C1, and C2 horizons is 45 to 85 percent. The C1 horizon is absent in some pedons.

REFERENCES

1. American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

2. American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. In 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

3. United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

4. United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

GLOSSARY

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Inches

Very low, 0 to 3; Low, 3 to 6; Moderate, 6 to 9; High, more than 9; Very high, more than 12

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose. Noncoherent when dry or moist; does not hold together in a mass.

Friable. When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm. When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. When wet, readily deformed by moderate pressure, but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky. When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard. When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft. When dry, breaks into powder or individual grains under very slight pressure.

Cemented. Hard; little affected by moistening.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation, but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained. Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse-textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained. Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained. Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium-textured. They are mainly free of mottling.

Moderately well drained. Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained. Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained. Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained sokls are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand and boulders transported and deposited by glacial ice.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon. An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon. The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

A2 horizon. A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon. The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon. The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer. Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Miscellaneous areas. Areas that have little or no natural soil and support little or no vegetation.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows:

Abundance--few, common, and many

Size--fine, medium, and coarse

Contrast--faint, distinct, prominent

The size measurements are of the diameter along the greatest dimentsion. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse-textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pedon. The smallest volume that can be called "a soil." A pedon is three-dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow, less than 0.06 inch

Slow, 0.06 to 0.20 inch

Moderately slow, 0.2 to 0.6 inch

Moderate, 0.6 inch to 2.0 inches

Moderately rapid, 2.0 to 6.0 inches

Rapid, 6.0 to 20 inches

Very rapid, more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, differences in slope, stoniness, and thickness.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as:

pH
Extremely acid, below 4.5
Very strongly acid, 4.5 to 5.0
Strongly acid, 5.1 to 5.5
Medium acid, 5.6 to 6.0
Slightly acid, 6.1 to 6.5
Neutral, 6.6 to 7.3
Mildly alkaline, 7.4 to 7.8
Moderately alkaline, 7.9 to 8.4
Strongly alkaline, 8.5 to 9.0
Very strongly alkaline, 9.1 and higher

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils that have about the same profile, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are:

Platy (laminated)
Prismatic (vertical axis of aggregates longer than horizontal)
Columnar (prisms with rounded tops)
Blocky (angular or subangular)
Granular

Structureless soils are either single-grained (each grain by itself, as in dune sand) or massive (the particles adhering without regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Till plain. An extensive flat to undulating area underlain by glacial till.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the low lands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

NUMERICAL LISTING OF MAP UNITS

Map Symbol	Map Unit
1A	Udifluvents, occasionally flooded
2A	Somers Variant silt loam, 0 to 2 percent slopes
3A	Stryker Variant silt loam, 0 to 2 percent slopes
4B	Yellowbay sandy loam, 0 to 4 percent slopes
5B	Antero Variant sandy loam, 0 to 2 percent slopes
6B	Selon Variant-Yellowbay complex, 0 to 4 percent slopes
7B	Waits Variant fine sandy loam, 0 to 4 percent slopes
9B	Argenta Variant fine sandy loam, 0 to 2 percent slopes
10B	Glaciercreek gravelly silt loam, 0 to 4 percent slopes
10C	Glaciercreek gravelly silt loam, 4 to 8 percent slopes
10D	Glaciercreek gravelly silt loam, 8 to 15 percent slopes
11B	Yellowbay gravelly sandy loam, 0 to 4 percent slopes
20B	McCaffery Variant-Selon Variant sandy loams, 0 to 6 percent slopes
21B	Selon Variant very fine sandy loam, 0 to 4 percent slopes
21C	Selon Variant very fine sandy loam, 4 to 8 percent slopes
21E	Selon Variant very fine sandy loam, 15 to 35 percent slopes
30B	Half Moon silt loam, 0 to 6 percent slopes
30E	Half Moon silt loam, 10 to 30 percent slopes
31B	Mission Variant silt loam, 0 to 4 percent slopes
31D	Mission Variant silt loam, 8 to 15 percent slopes
40C	Courville, gravelly silt loam, 4 to 10 percent slopes
40D	Courville gravelly silt loam, 10 to 20 percent slopes
40E	Courville gravelly silt loam, 20 to 35 percent slopes
100	Riverwash

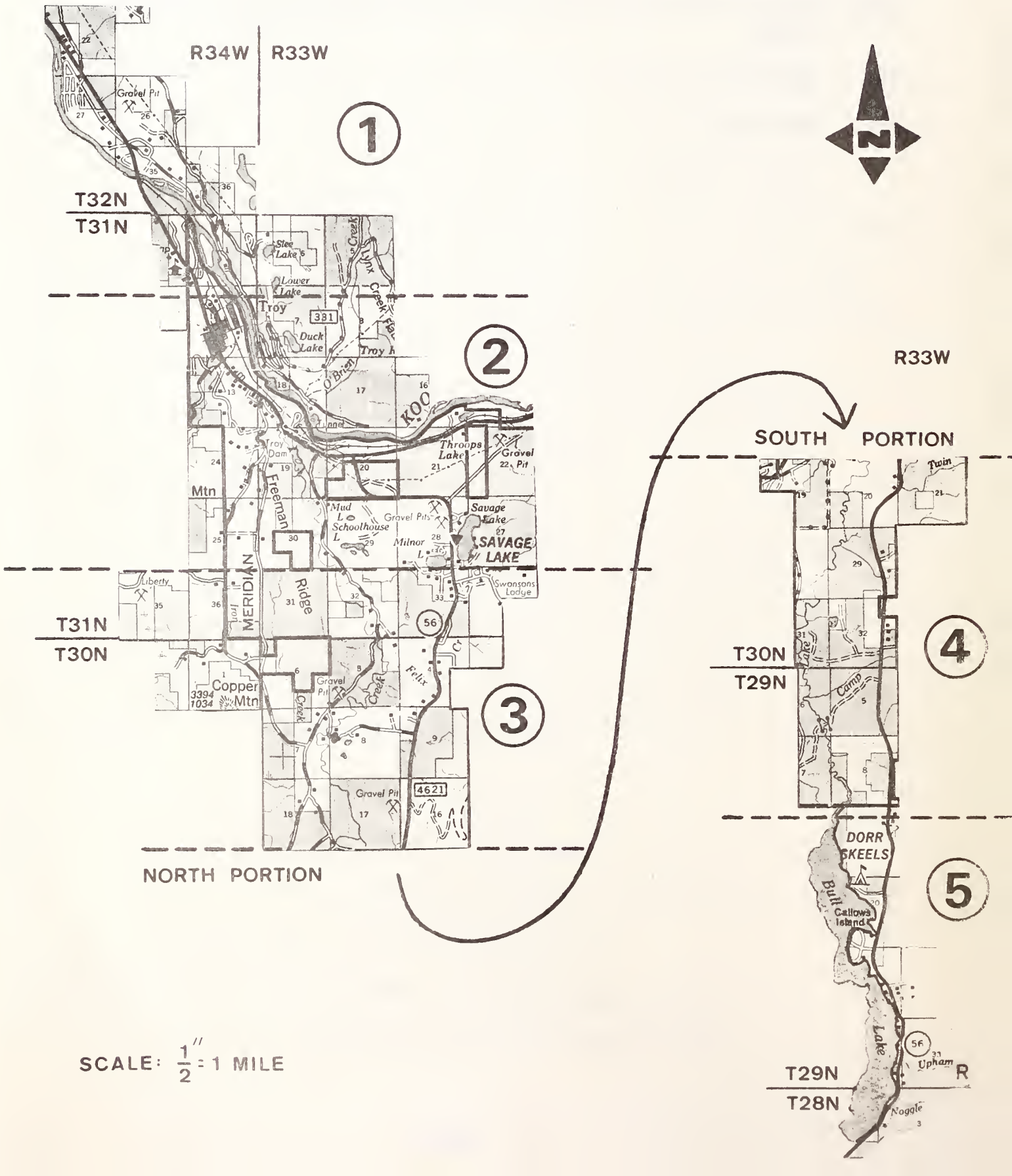
NUMERICAL LISTING OF MAP UNITS (continued)

Map Symbol	Map Unit
131C	Mission Variant silt loam, till substratum, 3 to 10 percent slopes
131E	Kraft Variant-Mission Variant, till substratum, silt loams, 10 to 30 percent slopes
140F	Courville-Mitten gravelly silt loams, 30 to 60 percent slopes
150E	Mitten-Courville gravelly silt loams, 10 to 30 percent slopes
150F	Mitten-Courville gravelly silt loams, 30 to 60 percent slopes
152G	Sharrott Variant-Mitten-Rock outcrop complex, 45 to 75 percent slopes
161F	Tevis-Yellowbay very gravelly sandy loams, 30 to 60 percent slopes
162F	McCaffery Variant-Selon Variant sandy loams, 30 to 60 percent slopes
163F	Glaciercreek-Yellowbay complex, 30 to 60 percent slopes
164E	Entente Variant-Selon Variant complex, 15 to 35 percent slopes
165F	Half Moon silt loam, 30 to 60 percent slopes
200	Rubble land, very steep
210D	Glaciercreek-Courville gravelly silt loams, 6 to 15 percent slopes
210E	Glaciercreek-Courville gravelly silt loams, 15 to 35 percent slopes
231B	Mission Variant-Somers Variant silt loams, 0 to 6 percent slopes
250F	Mitten-Sharrott Variant complex, 35 to 60 percent slopes
252G	Sharrott Variant-Rock outcrop-Tevis complex, warm, 45 to 75 percent slopes
300	Pits, gravel
331B	Savenac Variant-Mission Variant silt loams, 0 to 3 percent slopes
331C	Savenac Variant-Mission Variant silt loams, 3 to 10 percent slopes
340D	Courville stony loam, 10 to 20 percent slopes
350C	Mitten-Mission Variant complex, 3 to 10 percent slopes
350G	Mitten-Entente Variant complex, 45 to 75 percent slopes

NUMERICAL LISTING OF MAP UNITS (continued)

Map Symbol	Map Unit
400	Rock outcrop
431B	Mission Variant-Glaciercreek-Kraft Variant complex, 0 to 4 percent slopes
500	Marsh land
600	Made land

INDEX TO MAP SHEETS
TROY – BULL LAKE AREA
LINCOLN COUNTY, MONTANA



SCALE: $\frac{1}{2}$" = 1 MILE

TROY-BULL LAKE
SPECIAL SOIL SURVEY AREA
LINCOLN COUNTY, MONTANA

APRIL 1980

This map is intended for general planning. Each delineation may contain soils different from those shown on the map. Use on site inspection for more detailed decisions.

Source:
Base map prepared by SCS, WTSC Corto Staff using 1974 aerial photography
Thematic detail prepared by state staff

TROY-BULL LAKE
SPECIAL SOIL SURVEY AREA
LINCOLN COUNTY, MONTANA

APRIL 1980

MATCH TO SHEET 1

FOREST BOUNDARY

KOOTENAI NATIONAL

T. 31 N

Limit of Soil Survey

KOOTENAI RIVER

Duck Lake

Lynx Creek

Callahan Creek

Lake Creek

B.N.

NATL. FOREST BOUNDARY

S 5 7

KOOTENAI

Soil Survey

Limit of

Mud L.

Schoolhouse Lake

SAVAGE LAKE

Milnor Lake

MATCH TO SHEET 3

R. 34 W | R. 33 W

This map is intended for general planning. Each delineation may contain soils different from those shown on the map. Use on site inspection for more detailed decisions.

Source:
Base map prepared by SCS, WTSC Carta Staff using 1974 photography
Thematic detail prepared by state staff

TROY-BULL LAKE
SPECIAL SOIL SURVEY AREA
LINCOLN COUNTY, MONTANA

APRIL 1980

Source
Base map prepared by SCS, WTSC Carto Staff using 1974 aerial photography
Thematic detail prepared by state staff

This map is intended for general planning. Each delineation may contain soils different from those shown on the map. Use on site inspection for more detailed decisions.

MATCH TO SHEET 3

MATCH TO SHEET 5

R 33W

T30N
T29N.

FOREST BOUNDARY

NATIONAL FOREST BOUNDARY

KOOTENAI NATIONAL FOREST BOUNDARY

Limit of Soil Survey

Limit of Soil Survey

Twin Creek

Lake Creek

Porcupine Creek

Creek

Creek

Creek

Creek

Dry Creek

Camp Creek

Lake Creek

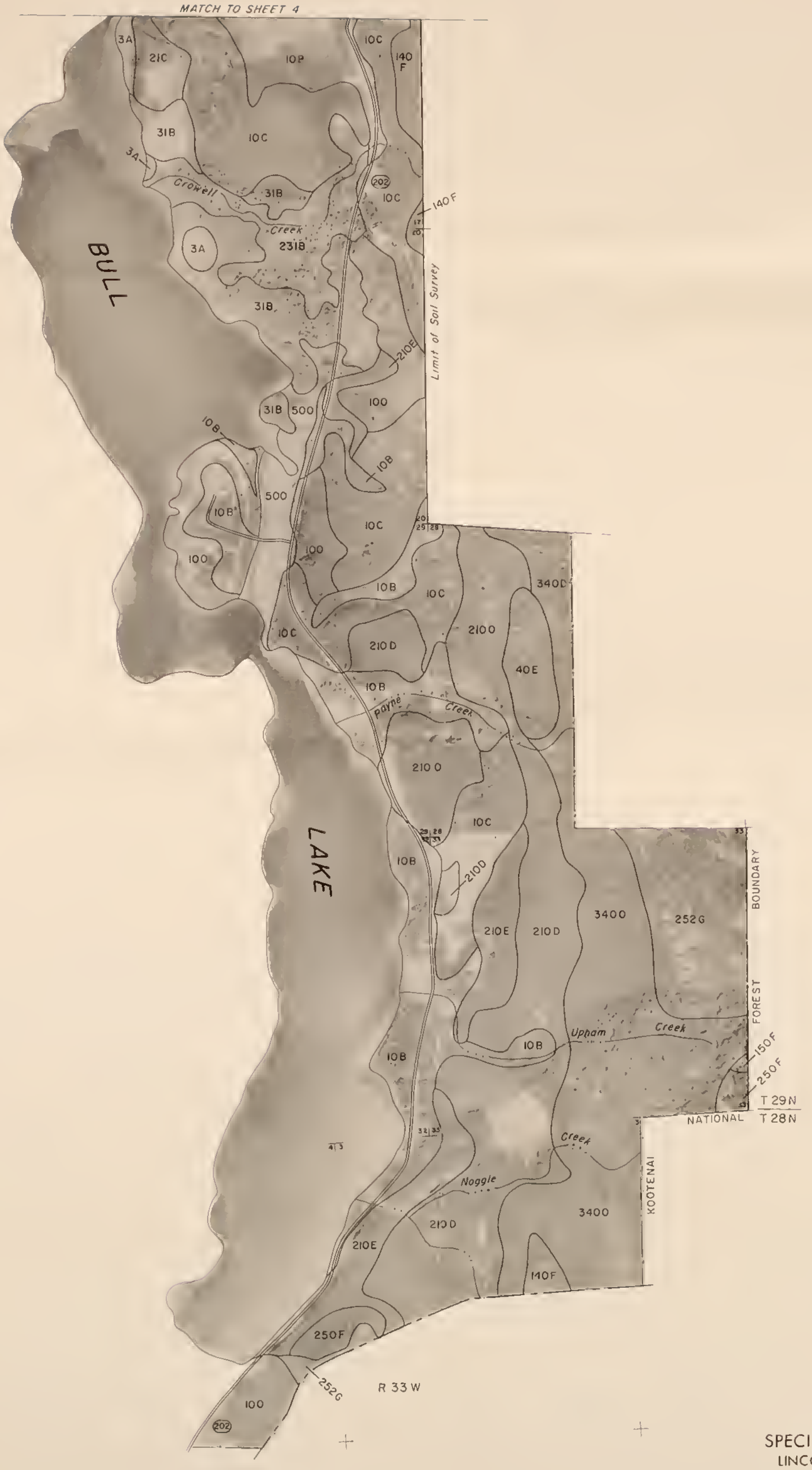
TROY-BULL LAKE
SPECIAL SOIL SURVEY AREA
LINCOLN COUNTY, MONTANA

APRIL 1980

This map is intended for general planning. Each delineation may contain soils different from those shown on the map. Use on site inspection for more detailed decisions.

Source.
Base map prepared by SCS, WTSC Carto Staff using 1974 aerial photography
Thematic detail prepared by state staff

MATCH TO SHEET 4



This map is intended for general planning. Each delineation may contain soils different from those shown on the map. Use on site inspection for more detailed decisions.

Source.
Base map prepared by SCS, WTSC Carto Staff using 1974 aerial photography
Thematic detail prepared by state staff.

TROY-BULL LAKE
SPECIAL SOIL SURVEY AREA
LINCOLN COUNTY, MONTANA

APRIL 1980